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Observation of a Dirac state in a half-Heusler material YPtBi[1]
CHRISTOPHER SIMS, M. MOFAZZEL HOSEN, GYANENDRA DHAKAL , KLAUSS DMITRI, University of Central Florida, HONGCHUL CHOI, Los Alamos National Laboratory, FIROZA KABIR, University of Central Florida, OREST PAVLOSIUK, PIOTR WISNIEWSKI, Polish Academy of Sciences, TOMASZ DURAKIEWICZ, JIAN-XIN ZHU, Los Alamos National Laboratory, DARIUSZ KACZOROWSKI, Polish Academy of Sciences, MADHAB NEUPANE, University of Central Florida — The prediction of non-trivial topological electronic states hosted by half-Heusler compounds makes them prime candidates for discovering new physics and devices as they harbor a variety of electronic ground states including superconductivity, magnetism, and heavy fermion behavior. Here we report a systematic study of normal state electronic properties of the superconducting half-Heusler compound YPtBi using angle-resolved photoemission spectroscopy (ARPES). Our data reveal the presence of a Dirac state at the Γ point of the Brillouin zone at 500 meV below the chemical potential. We observe the presence of multiple Fermi surface pockets including two concentric hexagonal and six half oval shaped pockets at the Γ and κ points of the Brillouin zone, respectively. Furthermore, our measurements show Rashba-split bands and multiple surface states crossing the chemical potential which are supported by the first-principles calculations. Our findings of a Dirac state in YPtBi play a significant role in establishing half-Heusler compounds as a new potential platform for novel topological phases and explore their connection with superconductivity.

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Christopher Sims
University of Central Florida

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