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**In-gap states on the non-polar (110) surface of $SmB_6$**[1] J.D. DENLINGER, SOOYOUNG JANG, Lawrence Berkeley Nat'l Lab, C.-H. MIN, F. REINERT, U. Würzburg, BOYOUN KANG, B.-K. CHO, GIST, D.J. KIM, Z. FISK, U.C. Irvine, J.W. ALLEN, U. of Michigan — Mixed-valent $SmB_6$ with a temperature-dependent bulk gap is the first candidate example of a new class of strongly correlated topological insulators with $f$-$d$ band inversion. The topological origin of in-gap states on cleaved (001) surfaces as measured by angle-resolved photoemission (ARPES) is not without controversy, since the $\overline{X}$ states span the full $\sim$20 meV hybridization gap at low temperature without exhibiting any clear Dirac point. Furthermore, reports exist of band-bending due to the polarity of the (001) surface and depth-dependent deviations from bulk stoichiometry or Sm valency. In this work we explore ARPES of the *non-polar* (110) surface of $SmB_6$ prepared by polishing and high-temperature annealing. We find in-gap states at $\overline{X}$ and $\overline{Y}$ points with very similar properties as the (001) $\overline{X}$ states. We discuss the relevance of these findings to the TI and other proposed models, and to the recent discrepancy between 2D [1] and 3D [2] interpretations of dHvA Fermi surface orbits.
[1] G. Li, *et al.*, Science **346**, 1208 (2014).
[2] B.S. Tan, *et al.*, Science **349**, 287 (2015).

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Jonathan Denlinger
Lawrence Berkeley National Laboratory

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