Highlights

Other Materials —2017

Three-Dimensional Electronic Structure of the Type-II Weyl Semimetal WTe_2

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By combining bulk sensitive soft-x-ray angular-resolved photoemission spectroscopy and first principles calculations (Fig.1) we explored the bulk electron states of WTe_2, a candidate type-II Weyl semimetal featuring a large nonsaturating magnetoresistance. Despite the layered geometry suggesting a twodimensional electronic structure, we directly observe a three-dimensional electronic dispersion. We report a band dispersion in the reciprocal direction perpendicular to the layers, implying that electrons can also travel coherently when crossing from one layer to the other. The measured Fermi surface is characterized by two well-separated electron and hole pockets at either side of the Γ point, differently from previous more surface sensitive angle-resolved photoemission spectroscopy experiments that additionally found a pronounced quasiparticle weight at the zone center. Moreover, we observe a significant sensitivity of the bulk electronic structure of WTe2 around the Fermi level to electronic correlations and renormalizations due to self-energy effects, previously neglected in first-principles descriptions.

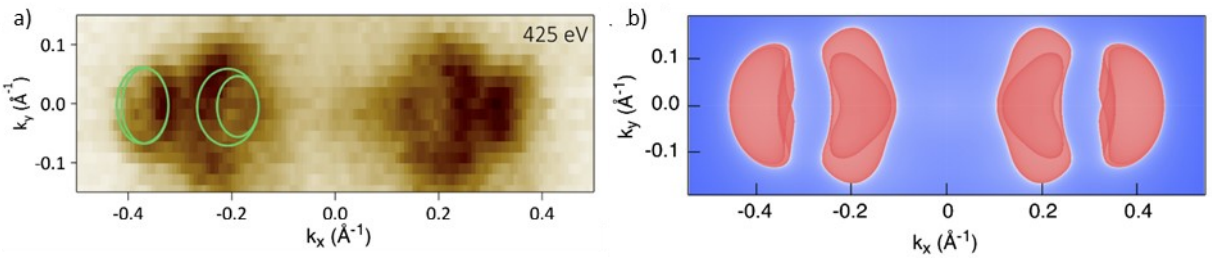

Fig.1 k_x-k_y Fermi surfaces for WTe_2 (a) recorded with soft-x-ray ARPES at hv= 425 eV and (b) calculated for bulk within the LDA+U approach (U = 2 eV).