Scanning Tunneling Microscopy of the Topological Dirac Semimetal ZrSiTe

Topological Dirac semimetals are interesting for their degenerate linear crossing in the bulk bands, resulting in a range of fascinating electronic properties, such as high electron mobility. Recently, research into Dirac nodal-line semimetals, which have a line or loop of linear band crossings within the Brillouin zone, has become abundant in the study of topological materials. Zirconium silicon sulfide (ZrSiS) was shown via ARPES to exhibit a Dirac nodal line crossing approximately 0.5 eV below the Fermi energy [1]. Using this material as a template crystal structure, zirconium silicon telluride (ZrSiTe) was predicted to strain the crystal lattice, pushing the Dirac crossing very near to the Fermi energy. This makes ZrSiTe a perfect candidate to study the properties of Dirac Fermions. Using scanning tunneling microscopy, we performed low temperature (4.5 K) bias spectroscopy and quasiparticle interference measurements, and I will present data helping to uncover the unique electronic band structure of this material. Furthermore, an outlook into future measurements to elucidate the magnetic and electronic properties of defect atoms using atomic force microscopy will be discussed.

[1] Leslie M. Schoop et. al. *Nature Communications.* (2016)