PRESENTER
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Torque Magnetometry Study Provides Intriguing Fermi Surface Topology of Zirconium Silicon Sulfide (ZrSiS)

PrePrint

Abstract

Topological materials have attracted enormous attention in recent days because of their potential applications in optoelectronics, quantum computing, green energy harvesting, etc. Recent theoretical and experimental studies have proved that ZrSiS is a nodal-line semimetal with the Dirac band crossings along a line. This study presents our recent torque magnetometry analysis to investigate the Fermi surface topology of ZrSiS under applied magnetic fields of up to 14 T. The magnetic torque exhibits clear oscillations at higher fields with several distinct frequencies. The specific frequency values and quantity of peaks change depending on the tilt angle between the applied field and the sample surface. The obtained results will be compared with other published data and possible origins of these frequencies will be discussed.

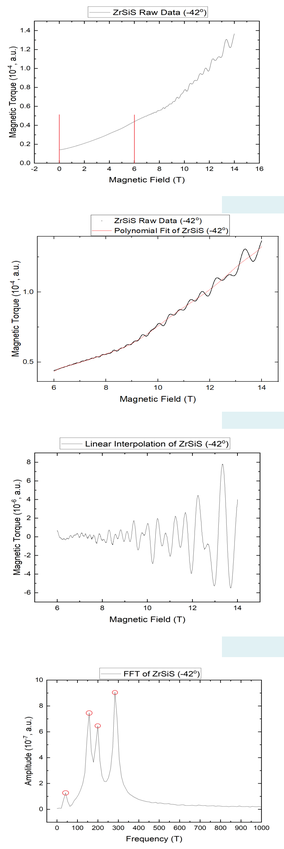
Methodology

Initial Collection
Raw data is collected.

Data Subtraction
Data collected before oscillations begin is removed.

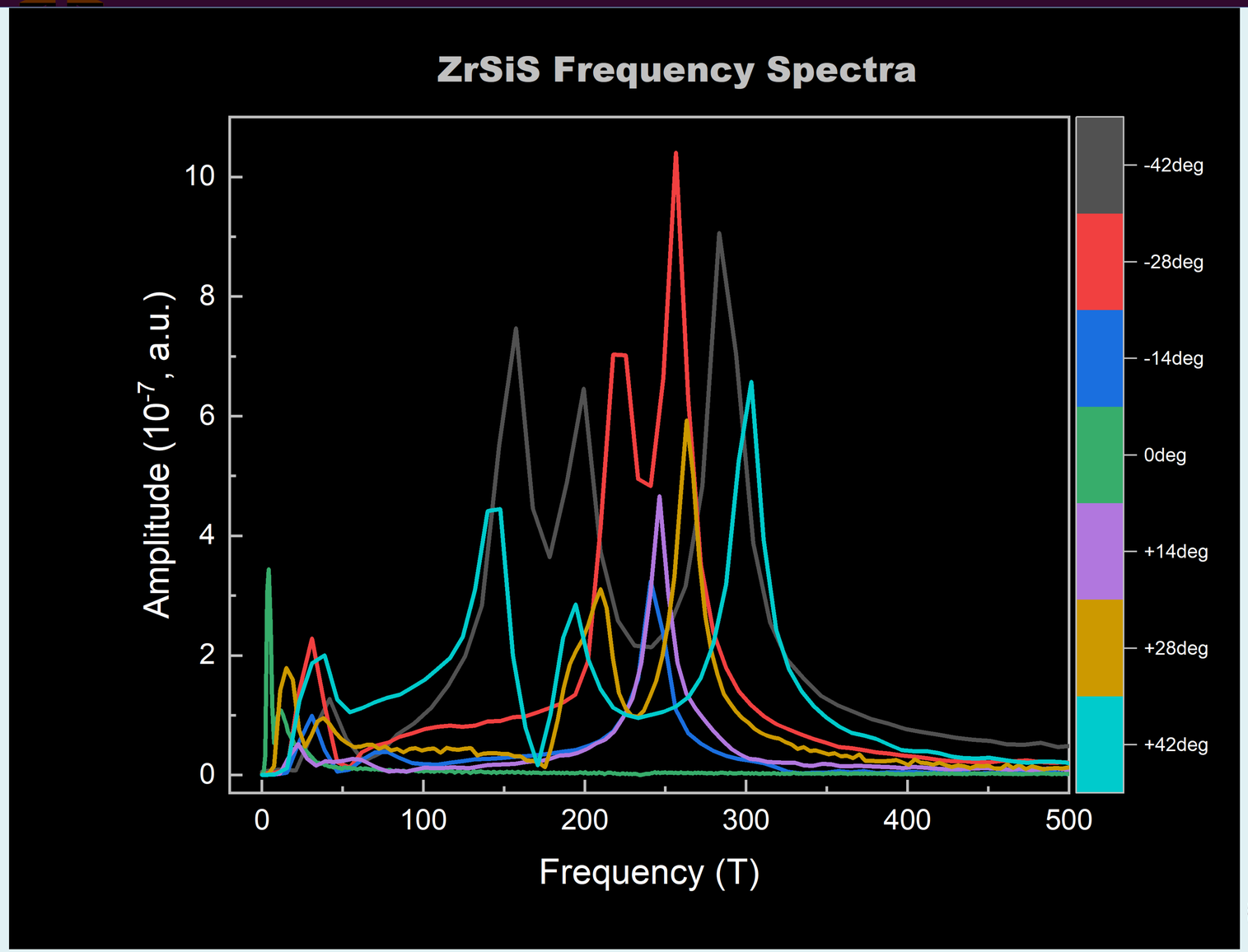
Polynomial Fitting & Interpolation
Data is fitted to a 9th-order polynomial and then interpolated to ensure even spacing between data points.

Fast Fourier Transform (FFT)
FFT analysis identifies specific frequencies occurring in torque oscillations.



Why ZrSiS?

Zirconium Silicon Sulfide is non-toxic and produced with plentiful materials. Having already been confirmed as a nodal-line semimetal, ZrSiS is an ideal candidate for continued characterization.



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