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Electronic and magnetic topological states in the kagome-net magnet YMn_6Sn_6

Abstract: In the search for the next generation of quantum materials that will push beyond the limits of current technology, Kagome magnets have excited researchers for their potential to exhibit magnetic and electronic topological characteristics. YMn_6Sn_6 is a member of the ternary Kagome magnets, known for their frustration-driven ground states and novel phenomena. YMn_6Sn_6 orders in an easy plane commensurate antiferromagnetic phase below T_N = 345 K, transitioning to an incommensurate distorted spiral (DS) structure upon further cooling. With field in the *ab*-plane, this DS structure evolves between multiple helical and fan-like phases prior to spin polarization. Electronic band structure calculations show topological character near the Fermi energy, making YMn_6Sn_6 a prime candidate to investigate the interplay between the electronic topology and magnetic topological properties. Here we report signatures in the magnetoresistance indicating strong coupling between the magnetic structure and the electronic band structure without the presence of a strong spin-orbit coupling. Regardless of field orientation, a decrease in resistivity above 6 mB/F.U. indicates a strong effect on the band structure properties, independent of magnetization, and characteristic of a rare magnetization driven Lifshitz transition.

Bio: Peter Siegfried received his PhD in 2020 from the University of Colorado, studying exotic magnetic materials and magnetotransport phenomena. In August of 2020 he started his post-doctoral studies in the Ghimire lab here at George Mason University. The current focus of his research is on the measurement and characterization of quantum materials whereby magnetic and electronic topology may be intertwined to achieve novel emergent phenomena.