MAS21-2021-000030

Abstract for an Invited Paper
for the MAS21 Meeting of
the American Physical Society

Electronic and Magnetic Properties of the Topological Kagome Metal YMn_6Sn_6

REBECCA DALLY, National Institute of Standards and Technology

YMn_6Sn_6 (Y166) exhibits topologically protected characteristics, which are unusual given the underlying centrosymmetric crystal lattice. The structure is composed of Mn atoms on a kagome lattice in the *ab*-plane, which are then stacked along the *c*-axis with the layers separated either by three Sn layers or a mixed Y and Sn layer. This stacking pattern has an important magnetic implication, mainly, that within a unit cell there are two unequal interlayer exchange pathways with opposite signs. A short-lived collinear antiferromagnetic phase, with an onset of $T_N \approx 340$ K, transitions below 333 K to a double-flat-spiral magnetic structure due to the exchange competition. At elevated temperatures and modest in-plane magnetic fields, a topological Hall effect (THE) emerges, [1,2] despite a null scalar spin chirality; dynamic chiral fluctuations are thought to be responsible, thus making Y166 a prototype material for a fluctuation based THE mechanism. [1] The application of the in-plane magnetic field also leads to a magnetic-temperature phase diagram that is quite complex. We have identified five magnetic phases via bulk measurements, and through theoretical and neutron diffraction studies were able to solve the magnetic structures for all but one of the in-field phases. [1,3] We also present a result obtained via a polarized neutron diffraction study. [3] Unexpectedly, unequal chiral domain populations of the zero-field spiral state were found despite the underlying centrosymmetric crystal symmetry. This could be a significant finding as it implies that the spiral state can energetically favor one domain over the other, possibly in a controlled manner. This is another example, along with the THE, of Y166 displaying unusual behavior for a structure with inversion symmetry.

1. Ghimire et al. *Sci.Adv.*, **6**, eabe2680 (2020).
2. Wang, et al. *Phys.Rev.B*, **103**, 014416 (2021).
3. Dally et al. *Phys.Rev.B*, **103**, 094413 (2021).