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Magnetic structure of the Mn moment in the magnetic weyl Semimetal Mn₃Sn

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In the last few years, Mn₃Sn has shown a large interest in condensed matter physics community due to the Weyl Semimetallic nature of this compound. Due to the emergent Berry flux from the Weyl points, Mn₃Sn shows interesting properties like Anomalous Hall Effect, Chiral magnetic effect, and other non-local transport properties.

Along with exotic transport properties, this material shows temperature-dependent magnetic structure. To understand the connection between Weyl properties with the magnetic structure we have performed single crystal neutron diffraction of Mn_{3.17}Sn sample at the HEiDi instrument at FRM II. Our diffraction experiment confirms that between 274 K < T < 420 K (TN) Mn moment order in an inverse triangular antiferromagnetic structure in the a-b plane. In the temperature range 50 to 274 K, Mn moments order in a spiral magnetic structure. The same spiral magnetic structure persists below 50 K down to 4 K where a spin-glass state was reported. The direct correlation between the magnetic structure and the Anomalous Hall Effect (AHE) is still unclear. As few groups claimed that in the incommensurate region (50 K to 190 K)1 no AHE was observed but other groups found AHE in this region2. We have observed AHE in the incommensurate region with amplitude compare to the published report.

Reference:

1. N. H. Sung et al. Applied Physics Letter 112, 132406 (2018).
2. S. Nakatsuji et al. Nature 527, 212 (2015).

Primary author: JANA, SUBHADIP

Co-authors: Mr RAI, Venus; NANDI, Shibabrata (JCNS2); Mr PERSSON, Jörg (Forschungszentrum Jülich GmbH, Jülich Centre for Neutron Science (JCNS-2) and Peter Grünberg Institut (PGI-4), JARA-FIT, 52425 Jülich, Germany); MEVEN, Martin (RWTH Aachen University, Institute of Crystallography - Outstation at MLZ); DUTTA, Rajesh (Institut für Kristallographie, RWTH Aachen University); BRÜCKEL, Thomas (Forschungszentrum Jülich GmbH)

Presenter: JANA, SUBHADIP

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