Peculiar magnetic phase in antiferromagnetic MnTe

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Antiferromagnets get increasing attention nowadays as their magnetic state is coupled to its resistance state and importantly, it may be influenced by electric current [1,2]. A new puzzling chapter has opened with the developments of topology- in particular, some antiferromagnets have been predicted to exhibit exceptional properties, induced just by the crystal symmetry induced by the crystal symmetry and not by relativistic effects [3], e.g. existence of anomalous Hall effect (even in a magnetically-compensated system). Recently, experimental evidence was made for RuO_2 [4] and thin MnTe films [5].

Hexagonal MnTe is a semiconductor with a moderate bandgap (about 1.3 eV), room temperature resistivity of about a few Ω·cm and the Néel temperature T_N of 308 K. We performed structural, transport and magnetic studies of state-of-the-art bulk samples in wide temperature and magnetic field range. Interesingly, on top of a classical signal indicating predominant p-type conductivity, the Hall resistivity ρ_{xy} shows strong temperature dependent features, including a clear hysteresis loop seen exclusively below T_N. However, the loop is flipped with respect to the one observed in epitaxial MnTe [5]. The presence of hysteresis in the Hall resistivity coincides with a weak ferromagnetic signal, resolved in SQUID magnetometry. A discussion about the origin of the observed phenomena will be provided.

References:

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