

ANOMALOUS HALL AND MAGNETORESISTANCE STUDY of BULK MnTe

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Hexagonal MnTe is an antiferromagnetic semiconductor that has been known for the last 6 decades. However, it is only recently that its physical properties have been revisited in the context of altermagnetism and a prediction of a large spin-splitting in the valence band [1]. In this paper anomalous Hall effect (AHE) and magnetoresistance of MnTe are studied. After demonstrating that the AHE linked to a weak ferromagnetic signal, both present in the antiferromagnetic phase of MnTe [2] we focus on the magnitude and sign of the AHE. It is well known [2] that the AHE in MnTe may be explained in terms of Dzyaloshinskii–Moriya interaction or coming from non-zero Berry curvature (BC). The BC calculations show that ρ_{xy} depends on the position of the Fermi level. We profit from the fact that MnTe is a semiconductor, and that its Fermi energy may be changed by doping. Our bulk MnTe samples show 3 orders of magnitude spreading of the resistivity at room temperature. We discuss the influence of the Fermi level position on the AHE observed. Magnetoresistance studies clearly show 6-fold symmetry of the crystal in the c-plane, as expected for the hexagonal lattice. A discussion of the link between easy magnetic axis in the hexagonal plane, magnetoresistance and the anomalous Hall effect will be provided.

References:

- [1] Libor Šmejkal et al. Phys. Rev. X 12, 040501 (2022)
- [2] K. P. Kluczyk et al. Phys. Rev. B 110, 15520 (2024)