Peculiar magnetic phase in antiferromagnet MnTe

K. P. Kluczyk[1], K. Gas[2], M. A. Borysiewicz[3], T. Fas[1], J. Suffczyński[1], E. Łusakowska[2], W. Wołkanowicz[2], J. Z. Domagała[2], P. Skupiński[2], K. Grasza[2], A. Mycielski[2], K. Výborný[4], M. Baj[1] M. Sawicki[2], and M. Gryglas-Borysiewicz[1]

[1] *Faculty of Physisc, University of Warsaw, Pasteura 5, Warsaw, Poland,*
[2] *Institute of Physics, Polish Academy of Sciences, Al. Lotników 32/46, Warsaw, Poland,*
[3] *Łukasiewicz Research Network - Institute of Microelectronics and Photonics, Al. Lotników 32/46, Warsaw, Poland,*
[4] *Institute of Physics, Academy of Sciences of the Czech Republic, Cukrovarnická 10, Praha, Czech Republic,*

Antiferromagnets get increasing attention nowadays as their magnetic state is coupled to its resistivity 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 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 band gap (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, optical, transport and magnetic studies of state-of-the-art bulk samples in wide temperature and magnetic field range. We have traced the Hall voltage behaviour revealing nonlinearities in $\rho_{xy}(B)$ dependence. The observed data were fitted in multi-carrier model, providing two hole and one electron channel. The results will be referred to the recent band structure calculations [6]. Moreover, similiarly to [5] we have observed a clear hysteresis loop in $\rho_{xy}(B)$ 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.

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