Nonlinear Magneto-Transport in $MoTe_2$

Anna Carolina Marx Goncalves
Tian Liu, Bart J. van Wees and Marcos H. D. Guimaraes
Zernike Institute for Advanced Materials, University of Groningen, Nijenborgh 4, Groningen 9747 AG, The Netherlands
a.c.marx.goncalves@rug.nl

Molybdenum Ditelluride ($MoTe_2$) is a semimetallic transition-metal dichalcogenide (TMD) that can be found in two different structural phases, differing in the layer stacking angle: the monoclinic β-$MoTe_2$ and the orthorhombic γ-$MoTe_2$. A phase change from γ to β is expected in bulk $MoTe_2$ at a temperature of around 240 K [1]. To probe if this structural phase-change also happens in few-layer crystals and to understand its impact the on the band structure of this material, we perform temperature-dependent magentoresistance measurements on mechanically exfoliated few-layer γ-$MoTe_2$. We verify that the amplitude of the second-harmonic resistance signal scales with the strength of the magnetic field. This is consistent with the bilinear magnetoelectric resistance (BMR) effect, as reported before for WTe_2[2] and Bi_2Se_3[3]. The BMR effect is an important tool to explore the spin-dependent band structure of a material. Our results show a sinusoidal behaviour of the second-harmonic resistance signal as a function of the magnetic field angle, indicating an in-plane spin component consistent with a Rashba-like system (Fig 1). Moreover, we observe a sign change between 150 and 300 K, indicating a possible effect from a structural phase transition.

References

[1] HP Hughes and RH Friend, J. Phys. C: Solid State Phys., 11 (1978) L103
[2] P He, CH Hsu, S Shi et al, Nat. Comm., 10 (2019) 1290
[3] P He, SS-L Zhang, D Zhu et al, Nat. Phys., 14 (2018) 495

Figures

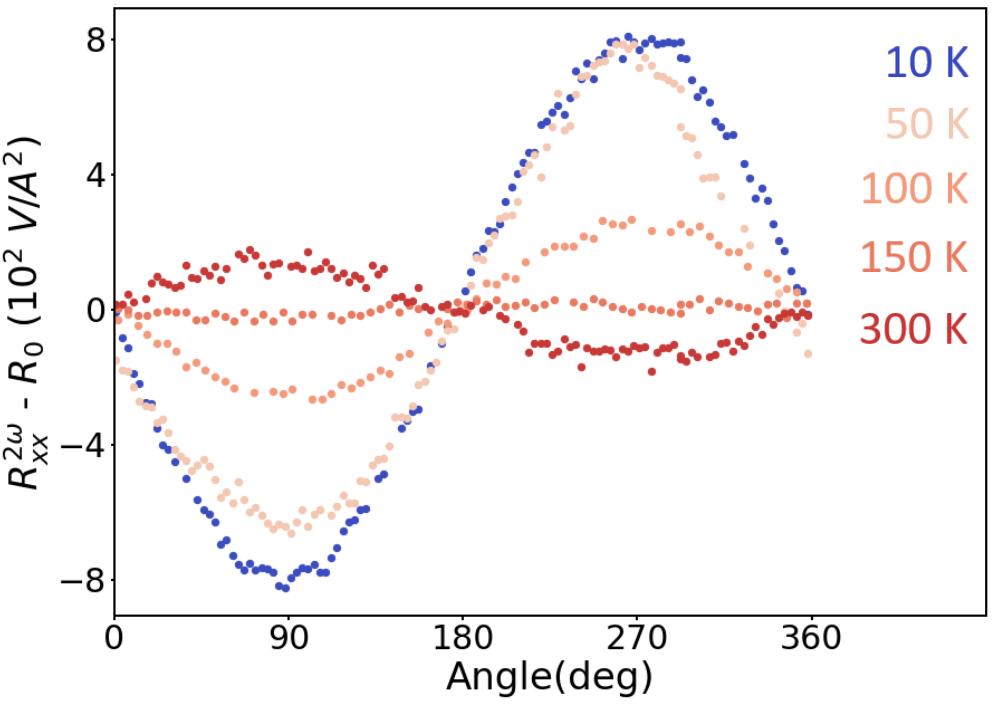

Figure 1: Second harmonic resistance measurement as a function of temperature in few-layer MoTe2.