Layer-dependent study of Shubnikov-de Haas oscillations in $NdTe_3$

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As a typical representative of the rare-earth tri-telluride family, bulk single crystals of $NdTe_3$ are layered metallic compounds stacked together by van der Waals interactions. The monolayer structure is composed of a NdTe slab surrounded by atomic Te planes organized in a square lattice. High carrier mobility, antiferromagnetic ordering below T_N = 2.7 K, and high charge-density-wave (CDW) transition temperature are the most prominent material electronic properties found in this compound [1].

In this work, we present a layer-dependent magnetotransport study of $NdTe_3$-based devices. Their magnetoresistance shows pronounced Shubnikov-de Haas (SdH) oscillations down to one unit cell (see Fig. 1). Using tilted magnetic fields, we can tune the system to multiple zero-spin states allowing to extract an effective g-factor of $g^* = 14 \pm 3$ in few-layer $NdTe_3$ flakes. Despite the quality losses we do not observe significant changes to the electronic structure of the material indicating that it retains its Fermi surface down to the lowest thicknesses. Additionally, we find a linear dependence of the cyclotron mass with the SdH frequency (i.e. the carrier concentration) which can be tracked down to the linear dispersion in the tightly-bound 2D Te lattice with a constant Fermi velocity $v_F = 5.8□10^5$ m/s.

[1] Dalgaard, K. J., *et al.*, *Phys. Rev. B* **102**, 245109 (2020).

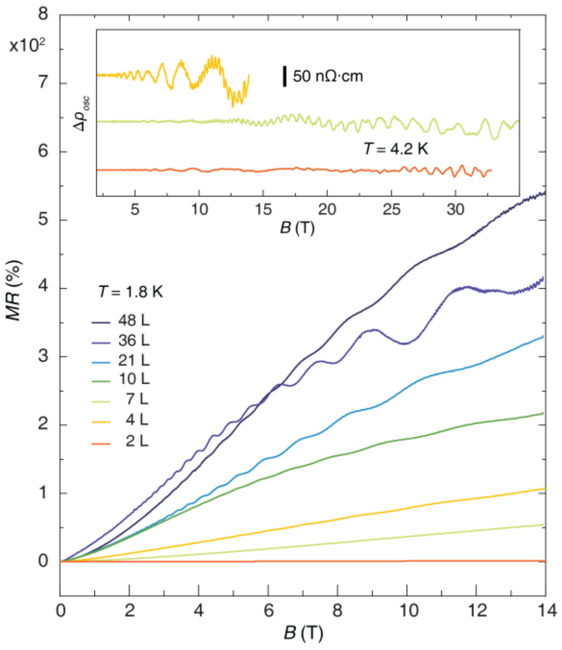

Fig. 1. Magnetoresistance, $MR = (\rho_{xx}(B) - \rho_{xx}(0)) / \rho_{xx}(0)$, of few-layer $NdTe_3$ devices as a function of the perpendicular field at T = 1.8 K for different sample thicknesses.

The inset shows the oscillating MR of the three thinnest few-layer sample measured at fields up to 35 T after background subtraction. The high-field data are taken at T = 4.2 K.