

Poster-2-17

Vertical electronic transport in the van der Waals antiferromagnetic semiconductor CrSBr

Xiaohanwen Lin,^{1,2} Fan Wu,^{1,2} Ignacio Gutiérrez-Lezama,^{1,2} Nicolas Ubrig,^{1,2} and Alberto F. Morpurgo^{1,2}

¹ *Department of Quantum Matter Physics, University of Geneva, 24 Quai Ernest Ansermet, CH-1211 Geneva, Switzerland*

² *Department of Applied Physics, University of Geneva, 24 Quai Ernest Ansermet, CH-1211 Geneva, Switzerland*

CrSBr, a unique van der Waals(vdW) magnetic semiconductor with extremely strong band structure anisotropy [1-2], has recently drawn attention for its transport properties. A previous study has demonstrated that the in-plane a- and b-direction transport response of CrSBr as incoherently coupled one-dimensional(1D) electronic chains, where the direction of the chain is along the b-direction [3]. Here, we will focus on the transport properties measured along the c direction that have remained unexplored so far. At low temperature, we observe nonlinear current-voltage characteristics and we discuss of the non-linearity originates from an interfacial contact effect (e.g. due to the Schottky barrier) or from the intrinsic properties of the material. We find a very large negative magnetoresistance of ninety thousand percent, approximately 2 orders of magnitude larger than in the a- and b-direction. These findings together with our previous investigation reveal the rich behavior of CrSBr with remarkable transport anisotropy.

[1] Telford, Evan J et al. *Advanced Materials*. 32, 2003240 (2020).

[2] Yang, Ke et al. *Phys. Rev. B*. 104, 144416 (2021).

[3] Fan, Wu et al. *Advanced Materials*. n/a, 2109759 (2022).