

## Poster-2-25

**Acid assisted synthesis of large CrTe<sub>2</sub> crystals**

Kai Daniel Röseler, Catherine Witteveen, Céline Besnard, and Fabian O. von Rohr

*Department of Quantum Matter Physics, University of Geneva, CH-1211 Geneva, Switzerland*

CrTe<sub>2</sub> is a metastable room-temperature ferromagnetic van der Waals material with a Curie temperature of  $T_C \sim 320$  K, which was first mentioned by Freitas *et al.* in 2015.[1] We have recently discovered a novel synthesis route using diluted acids to deintercalate flux-grown LiCrTe<sub>2</sub> yielding big, x-ray pure single crystals of this intriguing quantum material. Deintercalation of LiCrTe<sub>2</sub> using iodine, previously reported for the deintercalation of KCrTe<sub>2</sub>[2-4], was significantly slower and yielded partially deintercalated crystals. The crystal structure previously reported based on powder data was confirmed using single-crystal diffraction experiments. We found the Curie temperature of this ferromagnetic van der Waals material to be precisely  $T_C = 318$  K using an Arrott plot. Our combined DSC and diffraction experiments suggest a thermal transition of 1T-CrTe<sub>2</sub> into trigonal Cr<sub>5</sub>Te<sub>8</sub> above 355 °C. Our findings expand the synthesis methods for 1T-CrTe<sub>2</sub> crystals having the potential to be integrated into spintronic devices.[5]

[1] Freitas, D. C.; Weht, R.; Sulpice, A.; Remenyi, G.; Strobel, P.; Gay, F.; Marcus, J.; Núñez-Regueiro, M. Ferromagnetism in layered metastable 1T-CrTe<sub>2</sub>. *Journal of Physics: Condensed Matter* **2015**, *27* (17), 176002. DOI: 10.1088/0953-8984/27/17/176002.

[2] Purbawati, A.; Coraux, J.; Vogel, J.; Hadj-Azzem, A.; Wu, N.; Bendiab, N.; Jegouso, D.; Renard, J.; Marty, L.; Bouchiat, V.; *et al.* In-Plane Magnetic Domains and Néel-like Domain Walls in Thin Flakes of the Room Temperature CrTe<sub>2</sub> Van der Waals Ferromagnet. *ACS Applied Materials and Interfaces* **2020**, *12* (27), 30702-30710. DOI: 10.1021/acsami.0c07017.

[3] Purbawati, A.; Sarkar, S.; Pairis, S.; Kostka, M.; Hadj-Azzem, A.; Dufeu, D.; Singh, P.; Bourgault, D.; Nuñez-Regueiro, M.; Vogel, J.; *et al.* Stability of the In-Plane Room Temperature van der Waals Ferromagnet Chromium Ditelluride and Its Conversion to Chromium-Interleaved CrTe<sub>2</sub> Compounds. *ACS Applied Electronic Materials* **2023**, *5* (2), 764-774. DOI: 10.1021/acsaelm.2c01256.

[4] Sun, X.; Li, W.; Wang, X.; Sui, Q.; Zhang, T.; Wang, Z.; Liu, L.; Li, D.; Feng, S.; Zhong, S.; *et al.* Room temperature ferromagnetism in ultra-thin van der Waals crystals of 1T-CrTe<sub>2</sub>. *Nano Research* **2020**, *13* (12), 3358-3363. DOI: 10.1007/s12274-020-3021-4.

[5] Ou, Y.; Yanez, W.; Xiao, R.; Stanley, M.; Ghosh, S.; Zheng, B.; Jiang, W.; Huang, Y.-S.; Pillsbury, T.; Richardella, A.; *et al.* ZrTe<sub>2</sub>/CrTe<sub>2</sub>: an epitaxial van der Waals platform for spintronics. *Nature Communications* **2022**, *13*, 2972. DOI: 10.1038/s41467-022-30738-1.