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Anisotropic Magnetic Properties of the Layered Antiferromagnet LiCrTe2

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The reversible inclusion of molecules or elements into van-der-Waals structures is a chemical approach to manipulate materials. On one aspect, the inclusion is often accompanied with a redox reaction in which the host structure is partially reduced, therefore affecting the laters electronic properties with the addition of electrons. The other aspect is the evident change in lattice parameters upon the inclusion with a probable effect on the interlayer coupling. Here we report on the first time synthesis of $LiCrTe_2$ single crystals with the $TlCdS_2$ structure type, which can be visualised as covalently bound $CrTe_2$ sheets with Lithium sandwiched between them. We find this compound to order antiferromagnetically with a high Néel temperature of $T_N \approx 155$ K. Its characterisation by neutron powder diffraction (NPD) and MPMS shows a fully occupied Lithium site and a strong magnetic anisotropy with an A type antiferromagnetic ordering along the c-axis. A spin flip occurs around $\mu_0 H \approx 3$ T resulting in a ferromagnetic material along the c-axis. As the indirect synthesis of $CrTe_2$ by oxidation has been recently reported – opening up the pathways for a potential 2D ferromagnet stable in monolayer form – our results contribute to the broader context of alkali metal adsorption on the electronic and magnetic properties of layered these materials.