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Magnetic structure in the new two-dimensional van der Waals ferromagnet Fe3GaTe2

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Two-dimensional van der Waals (2D-vdW) ferromagnets are at the forefront of current condensed matter physics and materials science research due to their fascinating magnetic properties and massive potential in technological applications, such as magnetic tunnel junctions or spin current transmission. Fe_3GaTe_2, having a hexagonal structure of space group P63/mmc, is a new 2D-vdW ferromagnet with an exceedingly strong easy c-axis magnetic anisotropy and a very high Curie temperature (T_c) at about 380 K. There are similarities between Fe_3GaTe_2 and Fe_xGeTe_2 (x = 3~5), such as structure and magnetism. What is more striking is that Fe_3GaTe_2 has the best of both worlds: higher TC than Fe_3GeTe_2 and more valuable magnetic anisotropy than Fe_5GeTe_2, which makes Fe_3GaTe_2 particularly promising for potential applications. So far, few researchers have discussed the causes of Fe_3GaTe_2's high TC and perpendicular magnetic anisotropy. Here, we grow high-quality Fe_3GaTe_2 single crystals and analyze their magnetic structure and behavior using VSM, XRD, and single crystal neutron scattering. Our research contributes to the development of novel 2D-vdW magnetic materials and will help the research of spintronic materials in the future.

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