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Spin-lattice coupling and novel magnetic properties in the triangular lattice antiferromagnet Ag_2CrO_2

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Spin-lattice coupling plays an important role in selecting the ground state in the geometrically frustrated magnets, since a small amount of structural distortion is sufficient to lift the ground state degeneracy and stabilize a long-range magnetic order. Ag_2CrO_2 consists of insulating triangular lattice planes of CrO_2 (Cr^{3+} ion with S=3/2), which are separated by the metallic Ag_2 layers. Interestingly, the electric transport in the Ag_2 layer is strongly affected by the magnetism in the CrO_2 layer. We performed neutron diffraction experiments on this material and found that a partially disordered state with 5 sublattices abruptly appears at T_N=24 K, accompanied by a structural distortion [1]. The spin-lattice coupling stabilizes the anomalous state, which is expected to appear only in limited ranges of further-neighbor interactions and temperature. The nonnegligible further-neighbor interactions suggest the existence of the RKKY interaction mediated by the conduction electrons. We have recently performed inelastic neutron scattering experiments and found anomalous magnetic excitations, which cannot be explained simply by the linear spin-wave theory.

[1] M. Matsuda *et al.*, Phys. Rev. B 85, 144407 (2012).