

Magnetic Order in the Quasi-One-Dimensional Ising System RbCoCl₃

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The magnetic order in RbCoCl₃ was investigated in a series of neutron scattering experiments at SINQ, PSI, on powder and single-crystal samples between 1.5 K and 300 K. RbCoCl₃ is a hexagonal perovskite of CsNiCl₃ type structure. It crystallizes in space group P6₃/mmc with lattice parameters of $a=7.0003(3)$ Å and $c=5.9959(2)$ Å at room temperature. Upon cooling the octahedrally coordinated high-spin Co²⁺ ions show one-dimensional (1D) antiferromagnetic (AFM) interactions along the c-axis. At TN₁=28 K 3D AFM order occurs with $k=(1/3,1/3,1)$. The magnetic moments are aligned along the c-axis with $\mu_z=3.97(2)$ μB and an amplitude modulation in the ab-plane. A second magnetic phase transition is observed at TN₂=13 K where the moments along the c-axis increase to $\mu_z=4.08(1)$ μB and two additional propagations $k=(0,0,1)$ and $k=(1/2,0,1)$ occur. The k-vectors were confirmed by single crystal neutron scattering. In agreement to the neutron scattering data, the magnetic susceptibility along the c-axis shows a broad maximum at 90 K due to 1D AFM interactions along the [CoCl₆/2]- chains. The heat capacity shows a λ-anomaly at TN₁ but no effect at TN₂. Results from inelastic neutron scattering on RbCoCl₃ will be presented separately.

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