Quantum fluctuations on triangular lattices of Ising spins

Collin Broholm

[1]*Institute for Quantum Matter and Department of Physics and Astronomy, Johns Hopkins University, Baltimore, MD 21218, USA*

The phase diagram and magnetic excitations of the single layer and the bi-layer triangular lattice antiferromagnets $K_2Co(SeO_3)_2$ and $K_2Co_2(SeO_3)_3$ are explored using neutron scattering, magnetization, and specific heat capacity measurements. The magnetism is based on effective spin-1/2 $3d^7$ Co^{2+} ions with easy-axis antiferromagnetic super-exchange interactions mediated by the selenite polyanion $[SeO_3]^{-2}$. There are important similarities between the magnetic properties of these materials including a zero field thermal cross over to quasi-two-dimensional $\sqrt{3} \times \sqrt{3}$ magnetic order and pronounced field-driven plateau phases. We extract the magnetic Hamiltonians from spin wave dispersion relations in the 1/3 plateau phase and gain an understanding of the rich magnetic excitation spectra by contrasting aspects of the single-layer and the bi-layer system.

* This work was supported as part of the Institute for Quantum Matter, an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Basic Energy Sciences under Award No. DE-SC0019331 and by the Gordon and Betty Moore foundation through the EPIQS program GBMF9456.