

KITAEV AND ISING COBALT-BASED MAGNETS: INSIGHTS FROM NEUTRON SCATTERING

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Cobalt-based materials were recently proposed to host strongly anisotropic interactions due to the presence of spin-orbit coupling [1], including the long-sought Kitaev interaction [2]. We use inelastic neutron scattering data to establish exchange Hamiltonian of several materials with magnetic Co^{2+} ions.

First, we show that high-field spin-wave dispersion of quasi-two-dimensional honeycomb material $\text{BaCo}_2(\text{AsO}_4)_2$ unequivocally points to the presence of strong Kitaev interaction [3]. Fitting neutron scattering data yields full magnetic Hamiltonian. We also establish its phase diagram and present evidence for its unique “double-zigzag” ground state.

Second, we also studied two members of the pyroxene mineral group. Using inelastic neutron scattering data, we showed that these cobalt-based pyroxenes are a platform for realization of strongly anisotropic exchange interactions. As we show, $\text{SrCoGe}_2\text{O}_6$ is proposed to host one-dimensional version of the Kitaev model [4]. The ground state and magnetic spectrum of orthopyroxene CoGeO_3 are a result of bond-dependent Ising interactions [5].

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