Bond-dependent anisotropy and magnon decay in van der Waals antiferromagnets

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The Kitaev model, a honeycomb network of spins with bond-dependent anisotropic interactions, is a rare example that gives the quantum spin liquid state as an exact solution. Although most Kitaev model candidate materials eventually order magnetically due to additional non-Kitaev interactions, their bond-dependent anisotropy manifests in unusual spin dynamics. It has recently been suggested that bond-dependent anisotropy can stabilize exotic magnetic phases on the geometrically frustrated triangular lattice. Unfortunately, few materials have been identified with simultaneous geometric frustration and bond-dependent anisotropy. In this talk, I will present spin dynamics of iodine-based van der Waals triangular antiferromagnet CoI2 [1] and NiI2 [2]. We found evidence of finite bond-dependent anisotropy in both compounds using inelastic neutron scattering. Our analysis shows that the Kitaev interaction is essential in explaining our experimental results. Our results provide the basis for future studies of the interplay between Kitaev magnetism and geometric frustration using van der Waals magnets.

[1] C. Kim et al., Nature Physics 19, 1624 (2023)

[2] C. Kim et al., (in preparation)