Neutron inelastic scattering study on the spin-1/2 fluoride kagome antiferromagnets

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True ground state of the spin-1/2 kagome antiferromagnets has been controversial for decades. Theoretically, a number of studies have been performed to date, and several possibilities were proposed, ranging from the resonating-valence-bond (RVB) spin liquids to its solidified version, *i. e.,* valence-bond-solids (VBS). Experimentally, however, not so many studies were performed to date, largely due to the lack of good model materials.

Recently, a family of fluoride kagome compounds, $A_2Cu_3MF_{12}$ (A = Cs, Rb; M = Zr, Hf, Sn) was discovered [1]. Macroscopic experiments confirmed a variety of grounds states in those compounds; for example, $Rb_2Cu_3SnF_{12}$ has the non-magnetic singlet ground state, whereas antiferromagnetic order was detected in $Cs_2Cu_3SnF_{12}$. To elucidate the microscopic nature of the ground states in the fluoride kagome antiferromagnets, we have performed single-crystal inelastic neutron scattering study. For the non-magnetic ground state in $Rb_2Cu_3SnF_{12}$, a pinwheel VBS state has been concluded from the Q-dependence of the singlet-triplet excitations [2,3]. On the other hand, for the ordered ground state in $Cs_2Cu_3SnF_{12}$, a significant reduction of spin wave excitation energies compared to those expected from the linear spin wave theory has been observed, indicating novel effect of geometrical frustration for the quantum spin system [4]. Further study on the mixed (Rb, Cs)$_2Cu_3SnF_{12}$ compounds is in progress.

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References

[1] T. Ono *et al.*, Phys. Rev. B 79 (2009) 174407.
[2] K. Matan *et al.*, Nat. Phys. 6 (2010) 865.
[3] K. Matan *et al.*, Phys. Rev. B 89 (2014) 024414.
[4] T. Ono *et al.*, J. Phys. Soc. Jpn. 83 (2014) 043701.