Quantum Kagome Antiferromagnets : Herbertsmithite vs Vesignieite

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The frustration of antiferromagnetic interactions on the loosely connected kagome lattice associated to the enhancement of quantum fluctuations for S=1/2 spins was acknowledged long ago as a key combination to stabilize novel ground states of magnetic matter of the spin-liquid type [1]. Only in 2005, a model compound, the Herbersmithite $ZnCu_3(OH)_6Cl_2$, could be synthesized and has triggered since then a remarkable activity[2]. Among the salient achievements in the study of this material are the absence of any kind of spin freezing down to at leat 50 mK through μSR experiments and a gapless susceptibility evidenced through ^{17}O NMR.

Vesignieite [3], $BaCu_3V_2O_8(OH)_2$, is one of the very few new recent candidate materials for this physics. In high quality powder samples[4], neutron diffraction measurements evidence that the kagome lattice is close to the perfect and indeed the susceptibility measured through ^{51}V NMR closely resemble that of Herbertsmithite [5]. However the low T behaviour of Vesignieite surprisingly contrasts with the one of Herbertsmithite. A kink in the susceptibility below $T = 9$ K is matched to a slowing of the spin dynamics observed by μSR and NMR. Our results point to an exotic quantum ground state with small frozen moments coexisting with slowly fluctuating ones. While Dzyaloshinskii-Moriya interaction is relevant in both compounds, we propose that it is large enough in Vesignieite to drive the system through a quantum critical point and towards a magnetic phase.

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