Single Crystal NMR Study of Frustrated Spin-liquid in S = 1/2 Kagome Lattice $ZnCu_3(OD)_6Cl_2$

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The spin-1/2 kagome lattice $ZnCu_3(OH)_6Cl_2$ exhibits no long range magnetic order down to 50mK, which makes it one of the most promising candidates for a quantum spin liquid. Despite the heightened level of interest in this material, the mechanism behind such a novel ground state in $ZnCu_3(OH)_6Cl_2$ has so far eluded thorough understanding, owing to the difficulty in identifying the location of defects, and in understanding what effects they may have on physical properties of this material. In particular, the bulk-averaged susceptibility reveals a strong enhancement below about 50K, which has been speculated to be a manifestation of Zn-Cu disorder. We investigated the local spin susceptibility of $ZnCu_3(OD)_6Cl_2$ single crystal [1] using NMR techniques [2]. Our results demonstrate that the large enhancement near T = 0 is not an intrinsic feature of the spin susceptibility of the kagome plane. Instead, it is an extrinsic effect caused by weakly interacting Cu^{2+} defect moments occupying Zn sites with $14 \pm 2\%$ probability. We explore the behavior intrinsic to kagome contributions by subtracting the defect contributions.

[1]T. H. Han *et al.*, Phys. Rev. B **83**, 100402(R) (2011)
[2]T. Imai *et al.*, arXiv: cond- matt/1103.2457; see also Phys. Rev. Lett. **100**, 077203 (2008)