Quantum Spin Liquid in an Organic Triangular Lattice Antiferromagnet $EtMe_3Sb[Pd(dmit)_2]_2$

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A quantum spin liquid state has been found in a quasi-two-dimensional organic spin 1/2 antiferromagnet on the triangular lattice, $EtMe_3Sb[Pd(dmit)_2]_2$, by means of enriched ^{13}C-NMR.[1] Neither classical magnetic ordering nor a spin-glass state exists down to 19 mK due to the spin frustration and quantum fluctuation, although the magnetic exchange interaction is 220∼250 K. The ^{13}C nuclear spin-lattice relaxation rate T_1^{-1} shows a clear kink at 1.0 K without broadening of the NMR spectrum. The result exhibits an exotic phase transition accompanied with symmetry breaking or topological ordering. The gradual temperature dependence of the relaxation rates above 1.0 K indicates that the excitations have no spin gap, while the dependence proportional to the square of the temperature below 1.0 K exhibits the appearance of an excitation gap that may imply a nodal gap rather than a full gap. Various attractive predictions have been proposed theoretically for the instability or transition in the quantum spin liquid. Our discovery of the transition is expected to give important information on a new instability of the quantum spin liquid.[2]

[1]T. Itou, A. Oyamada, S. Maegawa, M. Tamura and R. Kato, Phys. Rev. B **77**, 104413 (2008).
[2]T. Itou, A. Oyamada, S. Maegawa and R. Kato, Nature Phys. **6**, 673 (2010).