Quantum Triangular Antiferromagnets Based on an Organic Molecule, $[Pd(dmit)_2]$

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In a series of $[Pd(dmit)_2]$ anion radical salts [1], an unpaired electron is localized on each dimeric unit, $[Pd(dmit)_2]_2^-$. The spin-1/2 units form a 2D quasi-triangular lattice with spatial anisotropy adjustable by the counter cations. The anisotropy favors antiferromagnetic long-range order (LRO) at low temperature. Unconventional ground states, with or without spin-gap, appear when the magnetic LRO is broken by frustration near the quantum critical point (QCP). These salts thus illustrate how the frustrated quantum spin system behaves around QCP at finite temperature. For example, a crossover from the frustrated high-temperature paramagnetic state to an antiferromagnetically correlated state is observed slightly above the LRO temperature, T_N. This crossover is analogous to the behavior of quantum fluid at finite temperature, where the long-range correlation is broken by the temperature-induced short-range fluctuations like rotons. The magnetic behavior near the pressure-induced Mott transition in these systems will be also discussed.

[1] R. Kato, Chem. Rev. **104**, 5319 (2004).

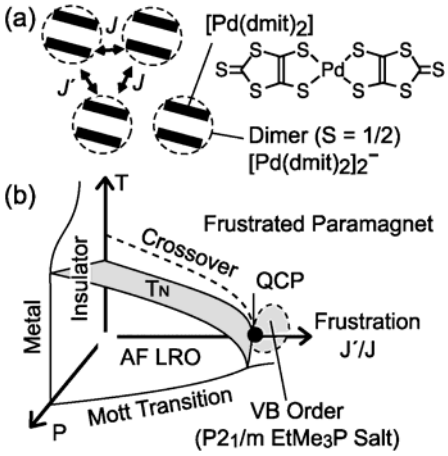

FIG.1: (a) Schematic view of the triangular structure of the $[Pd(dmit)_2]$ salts, (b) A sketch of the phase diagram.