Magnetism of Quantum Triangular Antiferromagnets [Pd(dmit)$_2$] Salts under Pressure

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The series of [Pd(dmit)$_2$] salts, $(C_2H_5)_x(CH_3)_{4-x}Z[Pd(dmit)_2]_2$ (x = 0, 1, 2; Z = P, As, Sb), are Mott insulators at ambient pressure. Their ambient pressure susceptibility is explained by the spin-1/2 Heisenberg model on the triangular lattice [1]. The spin-1/2 units $[Pd(dmit)_2]_2^-$ form spatially anisotropic triangular lattice layers. The anisotropy and electron correlation can be controlled by the counter cation and pressure [2], which provides rich variety of ground states (Néel-ordered, spin liquid, spin-gapped, metallic or superconducting phases), depending on the strength of frustration. We report here the magnetic behavior of these salts under pressure. The observed changes in magnetism near the quantum critical point are presented. In $(C_2H_5)(CH_3)_3P[Pd(dmit)_2]_2$ ($P2_1/m$), for example, the spin-Peierls-like transition from the frustrated paramagnet at 25 K is suppressed by pressure, and superconductivity appears above 0.2 GPa (T_c = 5 K) in the vicinity of the spin-gapped phase. The results are discussed from the viewpoint of the pressure and material control of frustration.

[1] M. Tamura, R. Kato*: J. Phys.: Condens. Matter* **14** (2002) L729.
[2] R. Kato: *Chem. Rev.* **104** (2004) 5319.