Frustrated Nuclear Magnetism of 2D Helium Three

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We will discuss recent experimental studies of frustrated two-dimensional (2D) magnetism of helium three (^{3}He) monolayer adsorbed on a graphite surface preplated with monolayer ^{4}He. The gapless spin-liquid nature of the magnetic ground state in the 4/7 phase (the low-density commensurate solid) has been further supported by two experiments, i.e., the magnetization curve measurement up to 11 T showing a 1/2 magnetization plateau and the spin-spin relaxation time (T_2) measurement showing a gradual decrease and saturation of T_2 with decreasing temperature. This exotic ground state could be ubiquitous in 2D frustrated magnetism near Mott localization. Comprehensive heat-capacity measurements revealed that, in the higher density incommensurate solid, we can introduce frustration into the pure Heisenberg ferromagnet on a triangular lattice and tune it by varying density. This becomes possible due to large and different Grüneisen constants of competing multiple-spin exchanges up to six-spin exchange.