Magnetic transition in β'-$(Me_2Et_2P)[Pd(dmit)_2]_2$ under pressure; ^{13}C NMR measurements

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β'-$(Et_2Me_2P)[Pd(dmit)_2]_2$ is known as a two dimensional (2D) Mott insulator in which a 1/2-spin localizes on a $Pd(dmit)_2$ dimmer. This system is considered to be a frustrated spin system due to quasi triangular dimmer arrangement in the 2D layer. At ambient pressure, the localized spins fluctuate due to antiferromagnetic interaction at high temperatures while it exhibits an antiferromagnetic long range ordering (LRO) below 17 K [1].

NMR measurements on a selectively ^{13}C enriched single crystal specimen were performed to clarify the spin dynamics at ambient and under pressure of 0.3-0.8 GPa. NMR spectrum was very narrow at high temperatures. On the other hand, a remarkable line broadening below 20 K and critical slowing down phenomenon around 20 K were observed. This clearly indicates LRO as observed in the previous work with a fully enriched sample [2]. The ordering temperature was almost the same as in the fully enriched sample. However the lineshape was much different; well-split four lines were observed at lower temperatures in the present sample (Fig. 1), instead of a broad peak without any structure in the fully enriched sample. The number of independent ^{13}C sites is two in the present experimental geometry. Considering that the ordering is antiferromagnetic, the LRO state should be colliear. Transition temperature was found to increase by applying pressure apart from in the vicinity of critical pressure (Fig. 2). At 0.85 GPa, where a metallic state was confirmed by transport study, no broadening nor relaxation anomaly was observed down to the liquid helium temperature.

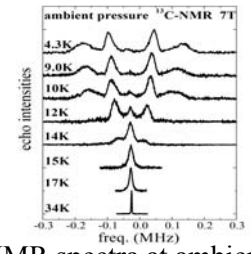

Fig. 1. NMR spectra at ambient pressure.

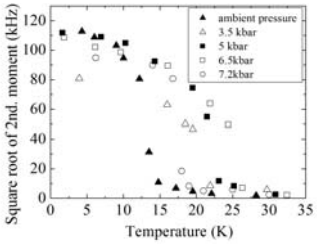

Fig. 2. NMR linewidth as a function of temperature.

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[2] T. Nakamura, H. Tsukada, T. Takahashi, S. Aonuma and R. Kato: Mol. Cryst. Liq. Cryst. **343**, 187, (2000)