Magnetic Properties of Intermediate Incommensurate Phase in Et\textsubscript{2}Me\textsubscript{2}Sb[Pd(dmit)\textsubscript{2}]\textsubscript{2} Studied by µSR

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Anion radical salts, Z[Pd(dmit)\textsubscript{2}]\textsubscript{2} (Z is a counter cation), are characterized by an isotropic or distorted triangular lattice of the Pd(dmit)\textsubscript{2} dimers in a two-dimensional (2D) layer. In the insulating phase, spin-1/2 is localized on each dimer. One of them, Et\textsubscript{2}Me\textsubscript{2}Sb[Pd(dmit)\textsubscript{2}]\textsubscript{2}, has an isotropic triangular lattice. It is suggested that the system undergoes a first order transition to a charge separation phase with formation of a spin-singlet state at \( T_{CS} = 70 \) K [1,2]. Our previous muon spin relaxation (µSR) study revealed the existence of the spin-singlet ground state [3]. However, the temperature at which an anomaly appeared in the muon spin relaxation rate was slightly different from \( T_{CS} \).

Recently, it was found by a high-resolution X-ray diffraction measurement that an intermediate incommensurate phase, where the degree of spatial distortion of the triangular lattice is modulated, appears below \( T_{IC} = 105 \) K and then the commensurate charge separation phase appears below \( T_{C} = 66.5 \) K. We performed more detailed µSR measurements on this system to investigate dynamical magnetic behavior in the incommensurate and commensurate phases. As temperature decreases, the amplitude of the relaxing component slightly increases below \( T_{IC} \), and then more remarkably increases below \( T_{C} \) (Fig. 1). This temperature dependence reflects changes in the dynamical fluctuation due to spatial distortion of triangular lattice below \( T_{IC} \) and formation of the spin-singlet state below \( T_{C} \).

Fig. 1. Temperature dependence of the amplitude of the relaxing component obtained from the zero-field µSR time spectra.

References