μSR study of magnetic ground state in Mo_3Sb_7

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It is suggested by electrical resistivity, magnetic susceptibility, and heat capacity measurements in Mo_3Sb_7that spin fluctuation coexists with conventional s-wave superconductivity (T_c=2.3K[1]) in this compound[2]. Meanwhile, a recent study on the similar bulk properties reports a small anomaly at 50K, and they suggest occurrence of an antiferromagnetic order or a spin-gap state below 50K associated with low-dimensional magnetism[3]. This also points to a possibility of unconventional superconductivity in Mo_3Sb_7, where the pairing mechanism is dominated by strongly correlated Mo 4*d* electrons as is suggested by an enhanced effective mass[2]. However, thus far microscopic magnetic properties of Mo_3Sb_7 are largely unknown. We performed μSR measurements in Mo_3Sb_7 to investigate the magnetic ground state below 50K.

Fig.1 shows the temperature dependence of the muon depolarization rate (λ(T)) under zero field in a polycrystalline sample of Mo_3Sb_7. The ZF-μSR time spectra exhibit a Gaussian-like relaxation over the entire range of measured temperature from 1.9K to 275K (see the inset of Fig.1), indicating that spin relaxation is dominated by nuclear dipolar fields. Interestingly, λoTp exhibits a slight but sharp increase below 50K and levels off at lower temperatures. This might be attributed to a change of the Gaussian linewidth associated with a symmetry-lowering structural transition of Mo_3Sb_7 below 50 K.

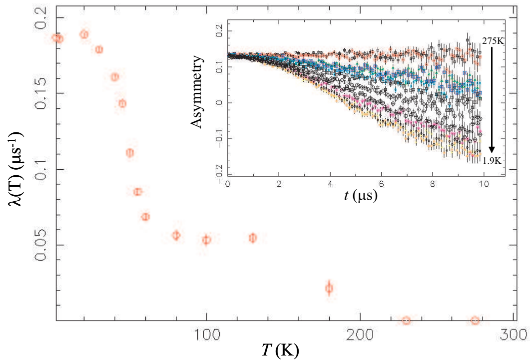

Fig.1 Temperature dependence of the depolarization rate ($\lambda(T)$). Inset shows the time evolutions of ZF-μSR spectra from 275K to 1.9K.

[1] Z. Bukowski et al, Sol. Sta. Comm. 123 (2002) 283.
[2] C. Candolfi et al., Phys. Rev. Lett. 99 (2007) 037006; Phys. Rev. B 77 (2008) 092509.
[3] V. H. Tran et al., Phys. Rev. Lett. 100 (2008) 137004.