Coexistense of superconductivity and magnetism in Tm-based superconductor probed by muon spin relaxation

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Magnetic property of a thulium-based superconductor, $Tm_5Rh_6Sn_{18}$ (superconducting transition temperature T_c = 2.2 K), is investigated by muon spin relaxation (μSR). Below around 6 K, development of a quasi-static local magnetic field is clearly inferred from the observation of spontaneous oscillation signal in the μSR spectra under zero external field, where the magnetism persists even below T_c (see Fig.1). The fractional volume of the magnetic component is estimated to be nearly 100%, strongly suggesting that the magnetism coexists with superconductivity. It is also inferred from μSR measurement under a longitudinal field that there remains a strong fluctuation of local fields at 2 K, indicating that the magnetic order is not represented by a simple static antiferromagnetism. Furthermore, the spin fluctuation lingers over a high temperature region ($\sim 10^2$ K). The origin of the strong spin fluctuation and its relationship with superconductivity will be also discussed.

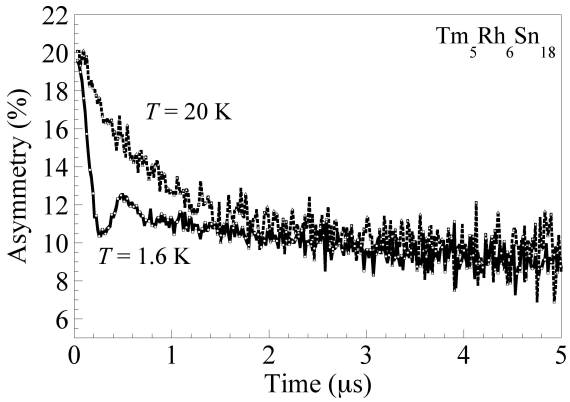

Fig. 1: ZF-μSR time spectra in $Tm_5Rh_6Sn_{18}$ at 1.6 K and 20 K.