(PS22)

μSR studies on the superconducting state in $Pr_xLa_{1-x}Os_4Sb_{12}$

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By using zero-field muon spin relaxation (ZF-μSR) tecnique, which has been proved to be an effective probe of internal magnetic fields, we observed spontaneous internal fields in the SC state, providing clear evidence for broken time-reversal symmetry (TRS) in $PrOs_4Sb_{12}$ [1]. On the other hand, in a non-$4f$ electron superconductor $LaOs_4Sb_{12}$ ($T_C = 0.74$ K) any anomalous internal magnetic fields have not been detected [2]. To investigate the role of $4f$-electrons for the TRS-breaking, we perform μSR measurement on La-substituted $Pr_xLa_{1-x}Os_4Sb_{12}$.

The μSR measurements were performed at the πA port of the Meson Science Labolaory, KEK-MSL, Japan. In $Pr_{0.6}La_{0.4}Os_4Sb_{12}$($T_C$=1.6K), ZF-$\mu$SR relaxation in SC state is slightly stronger than that in normal state. The spectra can be fit by Kubo-Toyabe function multiplied by exp(-Λt). This fact indicate that muons feel static and dynamic internal fields. The electronic (or SC) contribution Δ_e can be obtained from experimental Δ using $\Delta^2 = \Delta_n^2 + \Delta_e^2$, where Δ_{n^2} is the nuclear dipole contribution obtained in the normal state. For $Pr_{0.6}La_{0.4}Os_4Sb_{12}$, a spontaneous field of $\sim$ 0.6 Gauss is obtained. Results of LF-μSR and TF-μSR will also be presented.

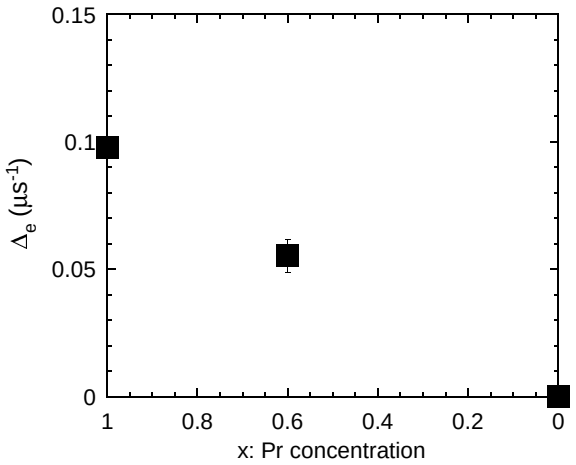

Figure 1: Pr concentration dependence of Δ_e in $Pr_{0.6}La_{0.4}Os_4Sb_{12}$

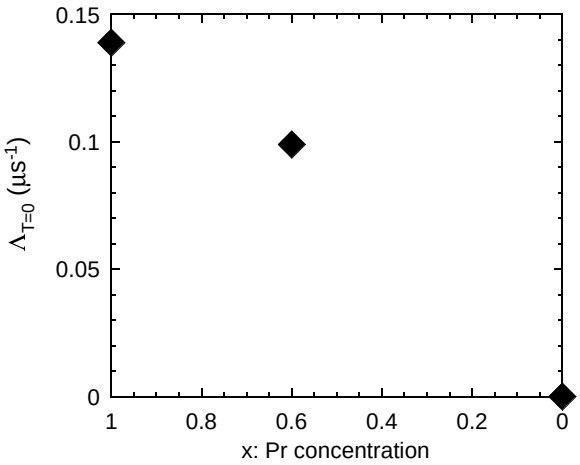

Figure 2: Pr concentration dependence of $\Lambda_{T=0}$ in $Pr_{0.6}La_{0.4}Os_4Sb_{12}$

[1] Y. Aoki *et al.* :Phys. Rev. Lett. 91 (2003) 067003
[2] Y. Aoki *et al.* to be published in Physica B (2005): proceedings of SCES2004.