Sb-Knight shift studies of the superconductor $PrOs_4Sb_{12}$

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Recently $PrOs_4Sb_{12}$ is reported to exhibit superconductivity below T_C=1.85K[1]. From the specific heat jump at T_C , $\Delta C/T_C$~500mJ/molK^2[1], $PrOs_4Sb_{12}$ is the first Pr-based heavy-fermion superconductor.

The purpose of this study is to investigate the physical properties of paramagnetic and superconducting state by ^{121}Sb-NMR from a microscopic viewpoint.

Angle and temperature dependence of ^{121}Sb-NMR were carried out on high-quality single crystals (#1: a rectangular parallelepiped shape , #2:a triangular prism shape). Under the magnetic field, Sb(24g) site is inequivalent and there exist three different Sb sites due to the difference of the direction of the electric field gradient. Therefore, observed NMR spectra are complicated. To extract Knight shift (KS), we calculated the nuclear spin Hamiltonian numerically by using the NQR parameters reported by Kotegawa et al[2]. Figure 1 shows the temperature dependence of the KS for #2. The KS behavior is anisotropic below T_C, though $PrOs_4Sb_{12}$ has cubic symmetry. For convenience, we defined crystal direction as shown in Fig.2. When the field is applied parallel to the particular direction defined [010], the KS decreases below T_C, whereas KS's for H// [-100] , [001] don't change below T_C. The reason why the KS for the particular direction changes below Tc is not clear at present, the present results suggest a spin-triplet superconducting state is realized in $PrOs_4Sb_{12}$. More detailed KS studies to investigate origin of anisotropic KS are now in progress.

[1]E. D. Bauer et al, Phys. Rev. B 65, 100506 -1(2002).
[2]Kotegawa et al,Phys Rev.Lett 90,027001(2003))

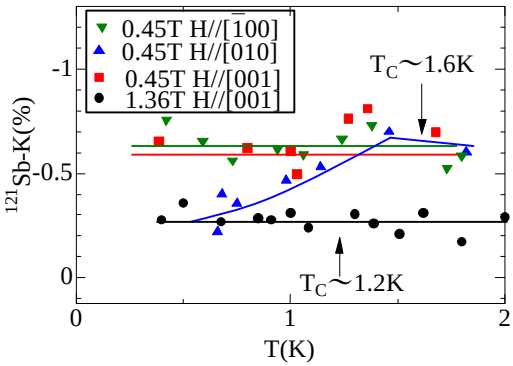

Fig.1 Knight shift at low T

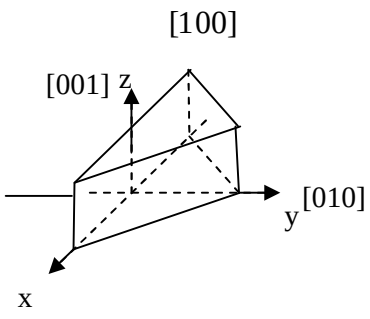

Fig.2 a sample of a triangular prism shape