(27b6)

Knight shift studies of single crystalline $PrOs_4Sb_{12}$

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Field-Angle-Resolved (FAR) NMR measurements have been carried out for a single crystalline skutterudite superconductor $PrOs_4Sb_{12}$ in order to unravel the novel properties, such as the unconventional superconductivity and field induced order. Figure 1 shows the ^{121}Sb(I = 5/2)-NMR spectrum for various samples (powder, single crystals with malti-domain #1, single-domain #2, #3). Broadened ^{121}Sb-NMR spectrum was observed for powder sample. On the other hand, sharp peaks in ^{121}Sb-NMR spectrum, which are split by nuclear quadrupole interaction, were observed for samples #2 and #3 (single-domain) when a static field H_0 is applied to $< 100 >$ direction ($\theta = 0°$). The obtained spectrum is well reproduced by a simulation using previous reported values of ν_Q = 44.143 MHz, η = 0.46 [1]. For sample #1 (multi-domain), many extra peaks are possible to be assigned by the signals with the field directions for ($\theta = 90°$, $\phi = 51°$) and ($\theta = 90°$, $\phi = 39°$). Here $\theta$is angle between H and the z-axis for the principal axes of electric field gradient tensor, and ϕ the azimuthal (Eueler) angle. This is consistent with the prediction from band calculations.

FAR-NMR was carried out for (5/2↔3/2) and (1/2↔-1/2) lines at fixed frequency f = 100.14 MHz by sweeping field, where the field direction was rotated from $H \parallel < 100 >$ to $< 001 >$ (Figure 2). Both peaks are quite sensitive to the rotational angle and are well reproduced by simulations. For $H \parallel < 100 >$, we measured temperature dependence of ^{121}Sb Knight shift (KS) at various magnetic fields (H=0.45, 1.35, 9.8 T). The KS not only shows the Curie-Weiss like temperature dependence, but also depends on the strength of applied fields. This behavior is quite similar to the T and H dependence of susceptibility. We will also give brief comments on quasi-particle susceptibility in this system.

[1] H. Kotegawa, M. Yogi, Y. Imamura, Y. Kawasaki, G.-q. Zheng, Y. Kitaoka, S. Ohsaki, H. Sugawara, Y. Aoki, H. Sato, Physical Review Letters, Vol.90, 027001/1-4, (2003).

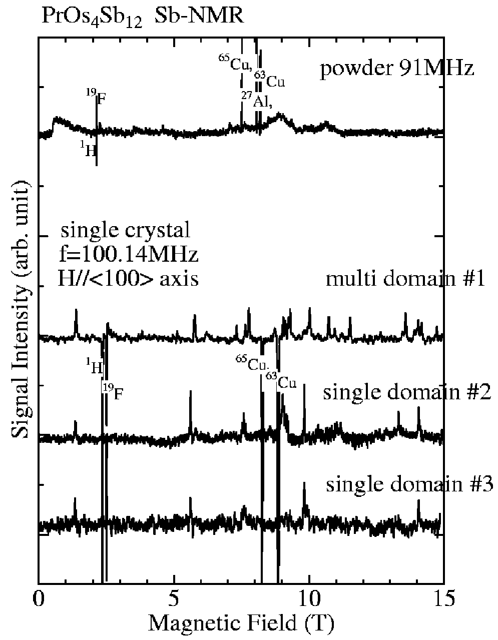

Figure 1: ^{121}Sb-NMR spectra in $PrOs_4Sb_{12}$.

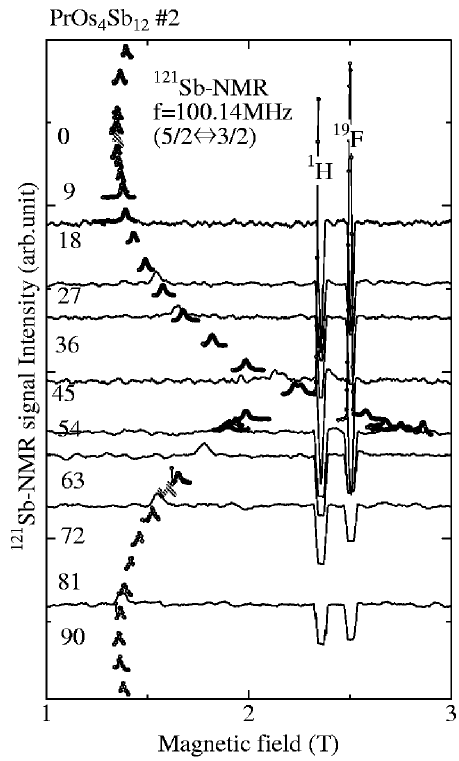

Figure 2: Rotational-angle dependence of ^{121}Sb-NMR spectra in $PrOs_4Sb_{12}$.