(P-28)

^{123}Sb-NQR study of $PrOs_4Sb_{12}$ under pressure

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We report ^{123}Sb nuclear quadrupole resonance (NQR) measurements of the filled skutterudite heavy-fermion superconductor $PrOs_4Sb_{12}$ under high pressure. The temperature dependence of NQR frequency and the spin-lattice relaxation rate $1/T_1$ indicate that the crystal-electric-field splitting $\Delta_{\rm CEF}$ between the ground state Γ_1 singlet and the first excited state $\Gamma_4^{(2)}$ triplet decreases with increasing pressure[1]. Ac-susceptibility measurements indicate that the superconducting transition temperature ($T_{\rm c}$) also decreases with increasing pressure. However, above $P \sim 2$ GPa, both $\Delta_{\rm CEF}$ and $T_{\rm c}$ do not depend on external pressure up to $P = 3.82$ GPa. These pressure dependences of $\Delta_{\rm CEF}$ and $T_{\rm c}$ suggest an intimate relationship between quadrupole excitations associated with the $\Gamma_4^{(2)}$ level and unconventional superconductivity in $PrOs_4Sb_{12}$. In the superconducting state, $1/T_1$ below $T_{\rm c} = 1.55$ and 1.57 K at $P = 1.91$ and 2.63 GPa shows a power-law temperature variations and are proportional to T^5 at temperatures considerably below $T_{\rm c}$. These data can be well fitted by the gap model $\Delta(\theta) = \Delta_0 \sin\theta$ with $\Delta_0 = 3.08\ k_{\rm B}T_{\rm c}$ and $3.04\ k_{\rm B}T_{\rm c}$ for $P = 1.91$ and 2.63 GPa, respectively. The results indicate there exists point nodes in the gap function.

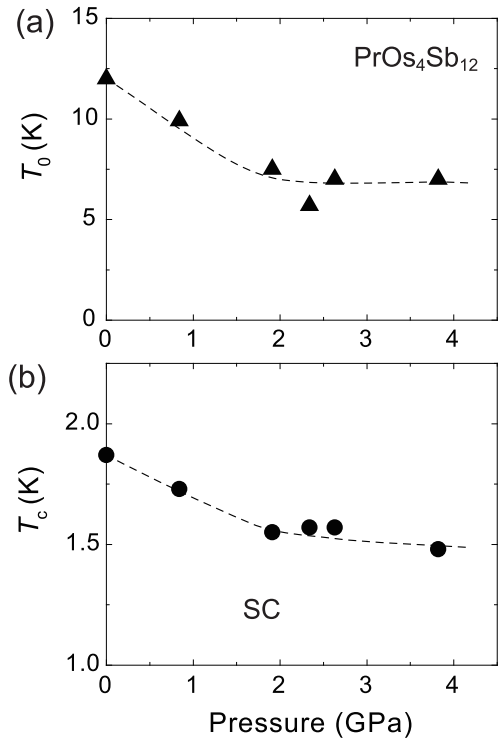

Figure 1: Pressure-temperature phase diagrams for $PrOs_4Sb_{12}$ for T_0 (solid triangles in (a)) and $T_{\rm c}$ (solid circles in (b)) determined by present results. Dotted curves are eye-guides.

[1] K. Katayama *et al.*, J. Phys. Soc. Jpn. **76**, 023701 (2007).