(PS30)

Sb-NQR study on $CeOs_4Sb_{12}$ and $CeRu_4Sb_{12}$

M. Yogi[1], Y. Kitaoka[1], H. Kotegawa[2], G. -q. Zheng[2], S. Ohsaki[4], H. Sugawara[3] and H. Sato[4]

[1]Department of Materials Engineering Science, Graduate School of Engineering Science, Osaka University, Osaka 560-8531

[2]Department of Physics, Okayama University, Okayama 700-8530

[3]Faculty of Integrated Arts and Sciences, Tokushima University, Tokushima 770-8502

[4]Graduate School of Science, Tokyo Metropolitan University, Hachioji, 192-0397

Most Ce-based-filled-Skutterudite compounds show a semiconducting behavior, that is called *a hybridization-gap semiconductor*. The CeT_4P_{12} (T=Fe,Ru and Os) compounds have a hybridization gap of 400∼1500 K, and as a lattice constant increases, the value of energy gap becomes smaller.

The measurements of nuclear-spin-lattice-relaxation-rate $1/T_1$ and NQR spectrum of Sb nuclei have revealed a novel phase transition at ~ 0.9 K in $CeOs_4Sb_{12}$. As indicated in Fig.1(a), the T dependence of $1/T_1$ behaves as if approaching closely to an antiferromagnetic (AFM) quantum critical point (QCP), following the relation of $1/T_1 \propto T/(T-T_N)^{1/2}$ with $T_N = 0.06$ K in the range of $T = 1.3 - 25$ K. The onset of either spin-density-wave (SDW) or charge-density-wave (CDW) order at $T_0 \sim 0.9$ K, that is of first order, is evidenced by the broadening of NQR spectrum and the marked reduction in $1/T_1$ just below T_0. The f-electrons derived correlated band realized in $CeOs_4Sb_{12}$ is demonstrated to give rise to the novel phase transition on the verge of AFM QCP.

$CeRu_4Sb_{12}$ exhibits semi-metallic conductivity and non-Fermi-liquid (NFL) behavior below $T \sim 5$ K [3,4]. As shown in Figs.1(a) and 1(b), both compounds indicate a similar T dependence of $1/T_1$ at high temperatures. A marked contrasted behavior emerges upon cooling below 20 K. The $1/T_1$ of $CeRu_4Sb_{12}$ stays constant below ~ 20 K, followed by a behavior of $T_1T =$ const. at low T regime below $T \sim 0.5$ K. This result is indicative of a Fermi liquid being realized as a ground state of this compound. More details are addressed in the workshop.

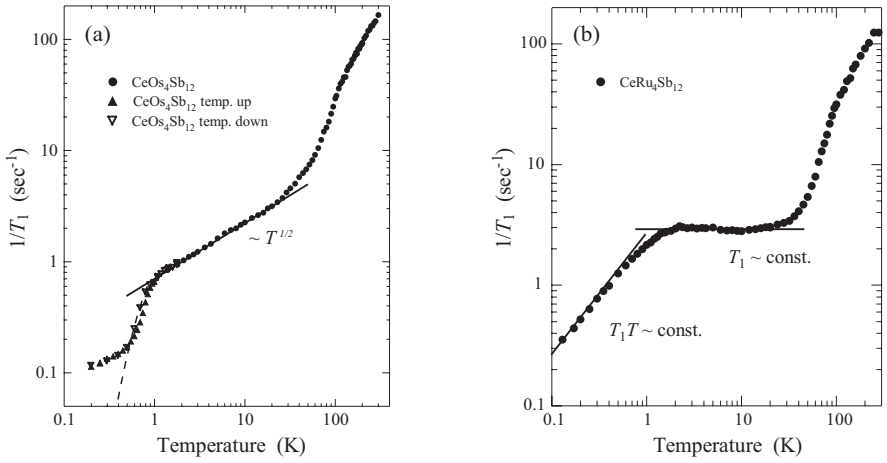

Figure 1: The T dependencies of $1/T_1$ for (a) $CeOs_4Sb_{12}$ and (b) $CeRu_4Sb_{12}$.

[1] E. D. Bauer, A. Ślebarski, E. J. Freeman, C. Sirvent and M. B. Maple, J. Phys.: Condens. Matter **13**, 4495 (2001).

[2] T. Namiki, Y. Aoki, H. Sugawara and H. Sato, Acta Phys. Pol. B, **34**, 1161 (2003).

[3] N. Takeda and M. Ishikawa, J. Phys. Soc. Jpn. **57**, 868 (2000).

[4] E. D. Bauer, A. Ślebarski, R. P. Dickey, E. J. Freeman, C. Sirvent, V. S. Zapf, N. R. Dilley and M. B. Maple, J. Phys.: Condens. Matter **13**, 5183-5193 (2001).