(PS 14)

Flux-flow resistivity in the heavy fermion superconductor $PrOs_4Sb_{12}$

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$PrOs_4Sb_{12}$ with the filled skutterudite structure($Im\bar{3}$) was reported to be the first Pr-based heavy fermion superconductor [1].

The recent Sb-NQR measurement has revealed that the temperature T dependence of nuclear-spin-lattice-relaxation rate $1/T_1$ shows no coherence peak just below T_c but an exponential T dependence, which differs from the conventional s-wave type and any unconventional ones with the line-node gap [2]. In the specific heat measurement at zero field [3, 4] and the dc magnetization in fields up to 140 kOe[5], double superconducting (SC) transitions have been observed like UPt_3. From the thermal transport measurements[6], Izawa *et al.* has reported two distinct SC phases in the H-T phase diagram; the gap function $\Delta(k)$ has two point nodes at a low field region and four point nodes at a high field region. In order to investigate the unconventional SC state in $PrOs_4Sb_{12}$, we have measured the flux-flow resistivity in the mixed state, which is sensitive to the change of vortex line state.

Figure 1 shows the magnetic field dependence of electrical resistivity at 1.3K for selected current density J. The peak effect observed in some rare-earth based compounds such as $CeRu_2$, shows only a single peak just under H_{c2}. The most interesting point in the case of $PrOs_4Sb_{12}$ is that double peaks are observed below H_{c2}. It may be related to the multiple phase reported by the thermal conductivity.

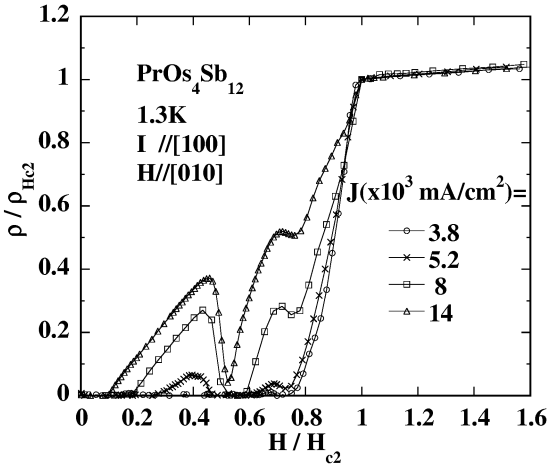

Figure 1: The magnetic field dependence of the flux-flow resistivity at 1.3K.

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[6] K. Izawa *et al.*, Phys. Rev. Lett. **90** (2003) 117001.