(30b3)

Local Magnetization Measurements in $PrOs_4Sb_{12}$

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$PrOs_4Sb_{12}$ is the first Pr-containing heavy-Fermion superconductor [1], and is reported to show unusual properties in the superconducting state. Two separate superconducting transition detected by specific heat measurements [2], and symmetry change from two-fold to four-fold measured by thermal conductivity [3] strongly suggest that the superconducting order parameter has internal degrees of freedom. In order to get some insight into the peculiarity of the superconducting state in $PrOs_4Sb_{12}$, we made local magnetization measurements using micro-Hall probe and magneto-optical technique.

Figure 1 shows the local magnetization hysteresis loop for $PrOs_4Sb_{12}$ measured by micro-Hall probe with an active area of 25×25 μm^2. There are two characteristic feature in these hysteresis loop. The first is the peak effect observed above 1.4 K, and the second is the anomaly close to $B = 0$ G. The peak effect can not be explained by any known mechanisms, such as synchronization. The most probable origin is the transition of some kind in either electronic, lattice, or vortex system. It may be tempting to interpret that the peak effect line is connected to the booundary between A and B phases reported by thermal conductivity measurements. However, the magnitude of the field in the present case is much lower than that reported in the case of thermal conductivity. Local magnetization anomalies near $B = 0$ G have been reported in other unconventional superconductors, UPt_3 [4] and Sr_2RuO_4 [5]. In time-reversal-symmetry-breaking superconductors, chiral domains coexist near $B = 0$ G, and their boundaries affects the pinning and/or dynamics of vortices.

Differential magneto-optical observations in the superconducting state reveal the presence of inhomogeneities when the vortices are penetrated into the crystal. Further studies are now in progress and the result will be reported in near future.

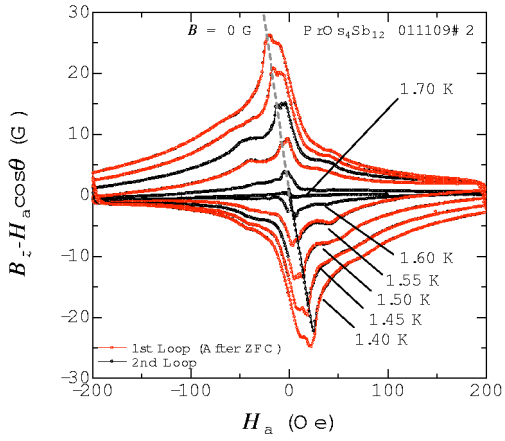

Figure 1: Local magnetization hysteresis loop for $PrOs_4Sb_{12}$ measured by micro-Hall probe.

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