

Transverse Magnetoresistance in $\text{SmFe}_4\text{P}_{12}$

D.Kikuchi¹, H.Sugawara², Y.Aoki¹, H.Sato¹

¹Graduate School and Faculty of Science, Tokyo Metropolitan University, Tokyo, 192-0397

²Faculty of Integrated Arts and Sciences, Tokushima University, Tokushima 770-8502

The filled skutterudite compound $\text{SmFe}_4\text{P}_{12}$ is reported to be the first Sm-based heavy fermion with ferromagnetic ground state[1]. We have reported the Fermi surface (FS) topology and the mass enhancement[2] based on the de Haas-van Alphen experiment. The observed FS of $\text{SmFe}_4\text{P}_{12}$ is nearly spherical one similar to that of $\text{LaFe}_4\text{P}_{12}$ [3], indicating the localized character of $4f$ -electrons in $\text{SmFe}_4\text{P}_{12}$. The results of the dHvA effect and transverse magnetoresistance in $\text{LaFe}_4\text{P}_{12}$ [3] suggest the existence of a multiply connected FS. However, such FS with the open orbit were not observed in $\text{SmFe}_4\text{P}_{12}$. To confirm the existence of the open orbit on the FS of $\text{SmFe}_4\text{P}_{12}$, we report the transverse magnetoresistance measurements.

Figure 1 and 2 shows the angular and field dependence of the transverse magnetoresistance $\Delta\rho/\rho = (\rho(H) - \rho(0))/\rho(0)$ for the current along the [001] at 0.4K in $\text{SmFe}_4\text{P}_{12}$. The angular dependence of $\Delta\rho/\rho$ were measured at $H = 7$ and 14T. A small angular dependence of $\Delta\rho/\rho$ is observed even at 14T, and the field dependence of $\Delta\rho/\rho$ for both $H//[100]$ and $H//[110]$ increases with $\sim H^{1.4}$. These results suggest the open orbit is not exist in the (001) plane.

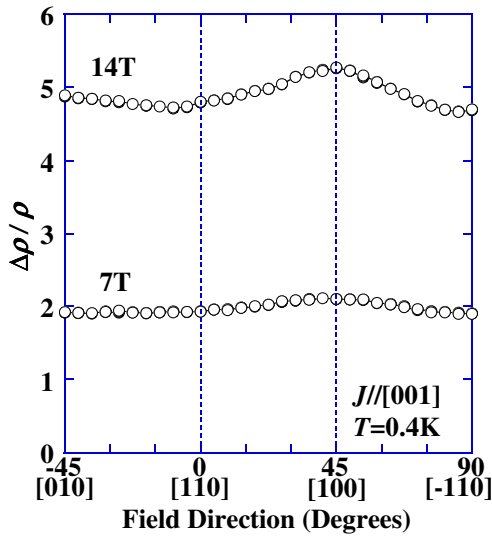


Figure 1: Angular dependence of the transverse magnetoresistance for the current along the [001] in $\text{SmFe}_4\text{P}_{12}$.

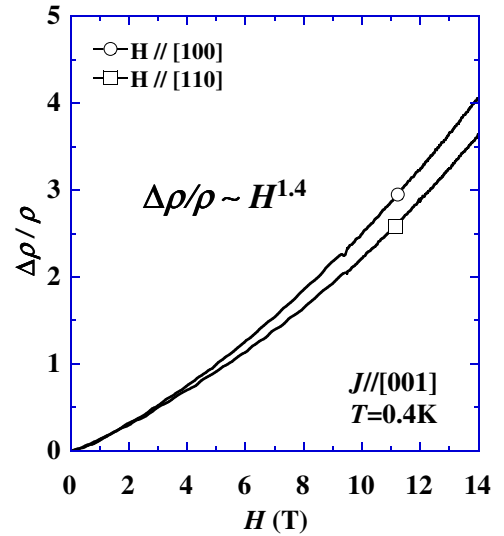


Figure 2: Field dependence of the transverse magnetoresistance for the current along the [001] in $\text{SmFe}_4\text{P}_{12}$.

[1] N. Takeda and M. Ishikawa J.Phys.: Condens. Matter 15 (2003) L229-L233

[2] D.Kikuchi, M.Kobayashi, H. Sugawara, Y. Aoki, H. Sato, H.Shishido, R. Settai, Y. Ōnuki: Proc. SCES'04 in preparation.

[3] H. Sugawara, Y. Abe, Y. Aoki, H. Sato, M. Hedo, R. Settai, Y. Ōnuki, H. Harima: J. Phys. Soc. Jpn. 69, 2938 (2000)