

### Crystalline electric field in $\text{UFe}_4\text{P}_{12}$

T. Takeuchi<sup>1,4</sup>, T. D. Matsuda<sup>2</sup>, A. Galatanu<sup>2</sup>, Y. Haga<sup>2</sup>, K. Sugiyama<sup>3,4</sup>, K. Kindo<sup>4</sup>, Y. Ōnuki<sup>2,3</sup>

1 - Low Temperature Center, Osaka University,  
Toyonaka, Osaka 560-0043, Japan

2 - Advanced Science Research Center, Japan Atomic Energy Research Institute,  
Tokai, Ibaraki 319-1195, Japan

3 - Graduate School of Science, Osaka University,  
Toyonaka, Osaka 560-0043, Japan

4 - Research Center for Materials Science at Extreme Conditions, Osaka University,  
Toyonaka, Osaka 560-8531, Japan

Recently, Matsuda *et al.* succeeded in growing single crystals of some uranium-based skutterudite compounds [1]. Among them,  $\text{UFe}_4\text{P}_{12}$  is known as a small-gap semiconductor and to show the ferromagnetic order below  $T_C = 3.15$  K [2]. We have measured the specific heat, magnetic susceptibility and high-field magnetization in the single crystalline sample of  $\text{UFe}_4\text{P}_{12}$  in order to clarify the crystalline electric field for a comparative study of U- and Pr-based skutterudite compounds. Figure 1 shows the high-field magnetization at 1.3 K for  $H \parallel [100]$ . The magnetization shows a ferromagnetic behavior at low fields and saturates above 20 T with a saturation moment of about  $1.3 \mu_B/\text{U}$ . The inverse susceptibility for  $H \parallel [100]$  follows the Curie-Weiss law in the temperature above 300 K with the effective moment  $\mu_{\text{eff}} \sim 3 \mu_B/\text{U}$  and the paramagnetic Curie-Weiss temperature  $\Theta_p = -98$  K, as shown in the inset of Fig. 1. We analyzed these data by the crystalline electric field model, assuming a  $5f^2$  electron configuration for U ions.

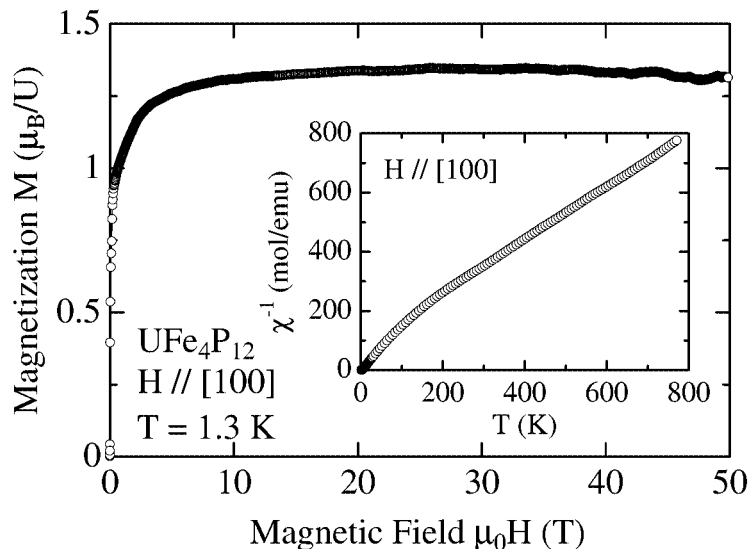


Figure 1: High-field magnetization curve at 1.3 K for  $H \parallel [100]$ . The inset shows the temperature dependence of the inverse susceptibility for  $H \parallel [100]$ .

[1] T. D. Matsuda *et al.*, PS26 in this poster session.

[2] H. Nakotte, N. R. Dilley, M. S. Torikachvili, H. N. Bordallo, M. B. Maple, S. Chang, A. Christianson, A. J. Schultz, C. F. Majkrzak, G. Shirane, *Physica B* **259-261** (1999) 280.