Study of Ferromagnetic Superconductor UGe_2 with XMCD Experiment under a high pressure II

*Y. Inada[1](7294), T. Honma[2](2073), N. Ishimatsu[3] (1706), N. Kawamura[2](1205), H. Maruyama[3] (1280), M. Sata[1] (14702), T. Sadamasa[1] (14701), R. Hirose[1] (14721), M. Yamaji[1] (14809), K. Son[3](14696), M. Yamada[3](14697), M. Suzuki[2](1173), Y. Haga[4](9729), T. Okane[4](389), S. Fujimori[4](1450), and Y. Onuki [5](7296)

[1]*Faculty of Edu., Okayama Univ., Okayama 700-8530 Japan, [2]JASRI, 1-1-1 Kouto, Mikazuki, Sayo, Hyogo 679-5198 Japan, [3]Grad. School of Sci., Hiroshima Univ, 560-0043, Japan, [4]JAERI / SPring-8, 1-1-1 Kouto, Mikazuki, Sayo, Hyogo 679-5198 Japan, [5]Grad. School of Sci., Osaka Univ., Toyonaka 569-0043 Japan

We have performed X-ray Magnetic Circular Dichroism (XMCD) experiments under a high pressure at Ge K-edge in 5*f* ferromagnetic compound UGe_2 (T_C = 52K). We have succeeded in observed the XMCD in fluorescent method with a diamond anvil cell. UGe_2 is known as a ferromagnetic superconductor. An anomaly exists at T^*~30K in the ferromagnetic state [1]. It is expected that the anomaly at T^* is related with the origin of the superconductivity. However, the nature of this anomaly has not been clear.

The anomaly around T^* was observed in the integrated intensities of XMCD spectrum in UGe_2 at the ambient pressure [2]. It is interesting how the anomaly changes under the high pressure.

The Ge K-edge XMCD spectrum and the XAS spectrum at 0.9GPa are shown in Fig. 1. They are similar to those at ambient pressure. The amplitude of XMCD spectrum is still large at 0.9 GPa. The temperature dependence of the magnetization shows an anomaly around 20K at 0.86GPa[1]. In our works, the temperature dependence of the integrated MCD spectra shows an anomaly around 20K, which corresponds to the magnetization. The shape of anomaly is different from that of at ambient pressure.

[1] N. Tateiwa *et al.*, J. Phys. Soc. Jpn. **70**, 2876(2001)

[2] the subject No. 2002B0617-NS2-np at BL39X

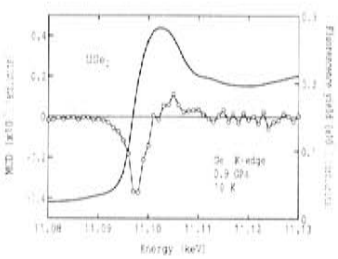

Fig.1. Ge K-edge XMCD spectrum and XAS spectrum at 10K in UGe_2 in field of 0.1T. The pressure is about 0.9GPa.

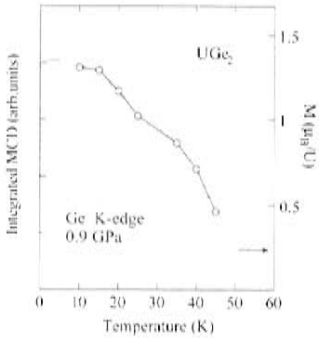

Fig.2. Temperature dependence of the integrated intensities of XMCD at 0.9GPa. Open triangels show the temperature dependence of the magnetization at 0.86GPa [1].

Hard x-ray imaging using photoelectron emission microscopy (PEEM)

Toshiyuki Taniuchi[a](13620), Takanori Wakita[b](454), Masato Kotsugi[c](1254), Motohiro Suzuki[b](1173), Naomi Kawamura[b](1205), Masafumi Takagaki[b](1343), Masaharu Oshima[a](4068), Hiroyuki Akinaga[d], Keisuke Kobayashi[b](1835), Kanta Ono[e,b] (4037)

a Univ. of Tokyo, b JASRI, c Hiroshima Univ., d AIST, e KEK

The research on ultra-high density recording media has been extensively performed. Among them, ultra-high density magnetic recording media are very important for the next generation hard disk drives (HDDs). The magnetic imaging of magnetic recording media is essentially important for the development as well as micromagnetics. We have performed a hard x-ray magnetic imaging using PEEM (Photoelectron emission microscopy) at the BL39XU of SPring-8 where the compact mobile PEEM was installed as shown in Fig.1.

Fig. 1 Photograph of the PEEM system installed at BL39XU

The spatial resolution of this PEEM system is estimated to be 40 nm using Co patterns made by electron-beam lithography.

Figure 2 shows an obtained magnetic image of CoCrPt magnetic recording media using circularly polarized x-ray at Pt L-edge. The spatial resolution of this magnetic image is 136 nm.

A hard x-ray magnetic imaging using PEEM is considered to be a key technique for element-specific nanoscale magnetic imaging with rather bulk sensitivity.

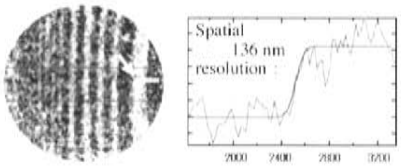

Fig. 2 Spatial resolution of magnetic image in magnetically patterned CoCrPt film.