XMCD study for Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$ alloy.

Takahiro AIDA, Tatsunori ITOGA, Masahide OHNO, Takafumi MIYANAGA, Teiko OKAZAKI
Department of Advanced Physics, Hirosaki University, Hirosaki, Aomori 036-8561, Japan

**Introduction**

FeRh alloy has an ordered CsCl structure and undergoes a transition from antiferromagnetic (AF) to ferromagnetic (FM) phase around 350 K [1]. This transition has an isotropic volume expansion, Giant Negative Magneto-resistance, and an entropy changes without the crystallographic structure change. Therefore, a technical application that makes best use of such a characteristic is paid attention now. The transition temperature decreases as replacing small amount of Pd atoms from Rh in FeRh.

XMCD (X-ray Magnetic Circular Dichroism) can separately measure a spin and orbital magnetic moment. These moments are calculated by the orbital and spin sum rule.

In this report, we measure the XMCD spectrum and apply the sum rule to ratio of Fe $L_{III}$-edge and $L_{II}$-edge in Fe and Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$

**Experimental**

The measured samples are Fe and Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$ alloy. The Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$ alloy was made by the Plasma Arc Melting method.

An incident angle of X-ray is 45 degree. The sample was set under a magnetic field in 0.2T along to the X-ray direction. To obtain both circularly polarized lights, the magnetic field is switched. The absorption coefficient is obtained by the electron yield method. Fe $L_{III}$-edge and $L_{II}$-edge XMCD measurements were carried out at BL 7A and BL 11A.

**Results and discussion**

Figure 1 shows the absorption coefficient around Fe $L_{III}$-edge and $L_{II}$-edge in Fe and Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$. The absolute values of these peaks for Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$ is higher than that for both circularly polarized lights.

Figure 2 shows XMCD spectra in Fe and Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$, which are obtained by subtraction each circularly polarized light.

Table 1 shows the integration value of the Fe $L_{III}$-edge (A) and $L_{II}$-edge (B) which are calculated from XMCD spectra. The magnetic moment of Fe atom in Fe and Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$ are also shown. And further the ratio of the integration values and the magnetic moments are presented.

The ratio of Fe and Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$ is 1.68 for A. On the other hand, that is 1.58 for B. And the ratio of Fe and Fe$_{49.7}$Rh$_{47.4}$Pd$_{2.9}$ of magnetic moment is 1.59. According to these data, we can confirm ratio of A and B can be approximate to magnetic moment ratio.

**References**