3C/2006G046

Spin and orbital magnetic form factor of 4f compound $CeRh_3B_2$ studied by X-ray magnetic diffraction

Tatsuki TADENUMA[1], Kosuke SUZUKI[1], Yoshiaki OBA[1],
Kensuke KITANI[1], Naruki TSUJI[1],
Hiromichi ADACHI[2$], Yoshiharu SAKURAI[3], Yoshichika ŌNUKI[4], Masahisa ITO*[1]
[1]Graduate School of Eng., Gunma Univ., Tenjin-cho 1-5-1, Kiryu, Gunma 376-8515, Japan
[2]KEK-PF, Oho 1-1, Tsukuba, Ibaraki 305-0801, Japan
[3]JASRI/SPring-8, Kouto 1-1, Sayo-cho, Sayo-gun, Hyogo 679-5198, Japan
[4]Graduate School of Sci., Osaka Univ., Machikaneyama 1-1, Toyonaka, Osaka 560-0043, Japan

Introduction

A 4f compound of $CeRh_3B_2$ has attracted much attention of physicist because of its anomalous ferromagnetism. The Curie temperature of this compound is the highest (Tc = 115K) among the known intermetalic compounds of Ce with nonmagnetic constituents. For understanding the anomalous magnetism of this compound it is important to study the magnetic structure of $CeRh_3B_2$.

Here we apply the X-ray magnetic diffraction (XMD) method to a single crystal of $CeRh_3B_2$. By this method the spin and orbital magnetic form factor can be separately measured. The aim of this study is to reveal the magnetic properties of this compound through the spin and orbital moment distribution in real space obtained by the XMD experiment.

Experiments

We utilized white beam of elliptically polarized synchrotron radiation from the bending magnet of BL3C. The sample crystal was irradiated by this beam and the diffracted X-ray intensity with 90 degree scattering angle was measured by a pure-Ge SSD. The magnetic field of 2.15T was applied to the sample crystal. The angle α between the directions of sample magnetization and incident X-rays was set to 0, 90 or 135 degree. The orbital magnetic form factor, the spin magnetic form factor, and the total (spin+orbital) magnetic form factor were measured under the condition of α=0, 135 and 90 degree, respectively, for the *hk*0 reciprocal lattice points.

Results and discussion

The obtained spin and orbital magnetic form factor of *hk*0 reciprocal lattice points are shown in Fig. 1 and Fig. 2, respectively. It is noted that the signs of the spin magnetic form factors are negative and that those of orbital magnetic form factors are positive. This indicates that the orbital magnetic moment is the dominant part of the total magnetic moment and is antiparallel to the spin magnetic moment. From Fig. 1 and Fig. 2 it would be noted that the distribution of the spin and orbital magnetic moments might be anisotropic in real space. We are trying to obtain the density distribution of spin and orbital magnetic moment in real space by the Fourier transform. The result will be reported in the near future.

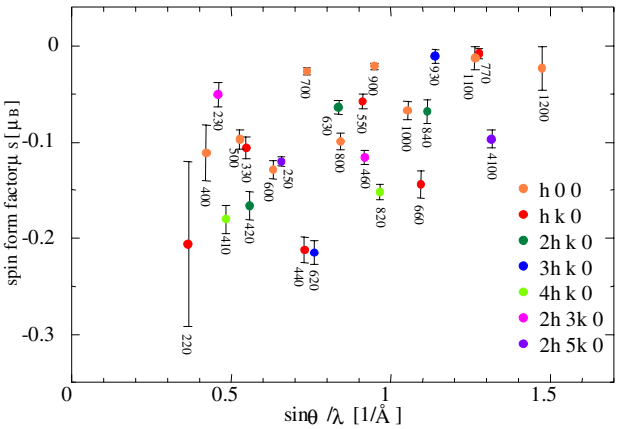

Fig.1: Spin magnetic form factor.

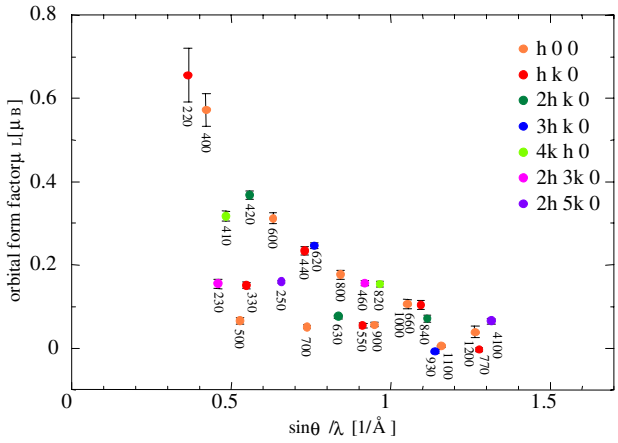

Fig.2: Orbital magnetic form factor.

[$]Present address: Center Develop. High. Edu. Prog., Shinshu Univ., Asahi 3-1-1, Matsumoto 390-8621, Japan.

*itom@phys.sci.gunma-u.ac.jp