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# Study of spin and orbital form factor of $CeRh_3B_2$ by X-ray magnetic diffraction

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## Introduction

An intermetalic compound of $CeRh_3B_2$ has attracted many scientists for its anomalous ferromagnetism. This material has the highest Curie temperature (Tc = 115K) among the known Ce compounds with nonmagnetic constituents. It is important to investigate the magnetic electrons of $CeRh_3B_2$ for understanding magnetism of this compound.

Magnetic properties of this compound were researched by the magnetic Compton scattering experiments [1,2] and the polarized neutron diffraction measurement [3]. In these researches together with bulk-magnetization measurement, the values of the spin and orbital magnetic moment of the constituent magnetic electrons were discussed. In the latter a possibility of distribution of delocalized magnetic electrons was discussed.

In this study we have applied the X-ray magnetic diffraction (XMD) to a single crystal of this compound. By this method the spin and orbital form factor can be independently 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

White beam of elliptically polarized synchrotron radiation from the bending magnet of BL3C was irradiated on the sample crystal and the diffraction intensity of *h*00 reciprocal lattice points with the 90 degree scattering angle was measured by a pure-Ge SSD. Magnetic field of 2.15T was applied to the sample crystal with an electromagnet. Direction of the magnetic field was reversed alternatively every 10 seconds. We measured the intensity $I_+$ and $I_-$, where $I_+$ is the diffraction intensity with a magnetization direction, and $I_-$ is the one with the opposite magnetization direction. Then we obtained relative intensity change, $(I_+ - I_-) / (I_+ + I_-)$, which is called flipping ratio. As the angle between the magnetization direction and the incident X-ray direction was set to be 135 degree, the spin magnetic form factor was selectively measured through the flipping ratio out of the total magnetic form factor.

## Results and discussion

The observed flipping ratio values are shown in Fig. 1. The obtained spin magnetic form factor of *h*00 reciprocal lattice points is shown in Fig. 2. It is noted that the signs of the spin magnetic form factors are negative. Positive sign is defined by the previous XMD measurement of Fe. This indicates that the spin magnetic moment is antiparallel to the orbital magnetic moment which is the major part of the magnetic moment. In the near future we will measure the orbital magnetic form factor, and obtain distribution of the spin and orbital magnetic moment in real space.

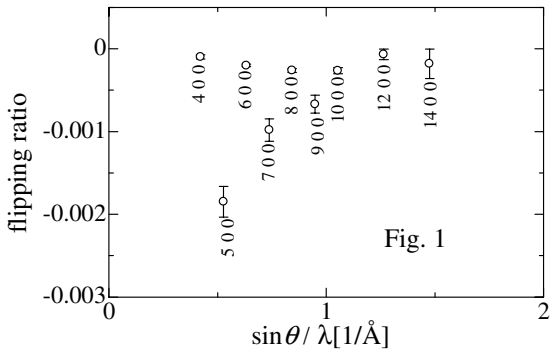


Fig. 1

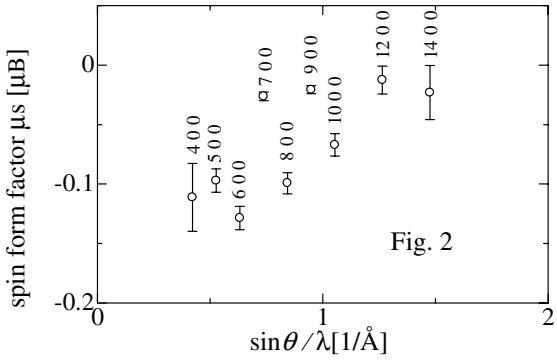


Fig. 2

## References

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