

A Study of 3d- t_{2g} Orbital in YTiO_3 by Magnetic Compton Profile Measurement

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The Magnetic Compton Scattering (MCS) experiment is one of prominent methods of observing the electron structure. The physical quantity obtained from this experiment is Magnetic Compton Profile (MCP). The MCP is directly linked to the wave function of magnetic electrons.

YTiO_3 is one of the compounds which show orbital ordering. The 3d electrons of Ti^{3+} ions in t_{2g} configuration exhibit orbital ordering. Crystal structure of YTiO_3 belongs to the perovskite of GdFeO_3 Type (Pbnm). This compound is ferromagnetic below 30K, and is insulator.

The experiment was performed at the KEK-PF-AR-NE1A1 Beamline. The x-rays of the energy of 60keV was incident on the sample. The scattered x-rays was measured with a pure Ge SSD at a scattering angle of 160 degree. The magnetization direction was aligned parallel to the scattering vector by using a super conducting magnet which produced magnetic field of up to 2T. The MCP was obtained by reversing the magnetization direction every 2 minutes. The temperature of the sample was 6K well below the Curie temperature, 30K.

We measured the MCPs of YTiO_3 with the scattering vector along a-, b-, and c-axis. The result is shown in Fig. 1 (a). The differences of the MCPs between a- and c-axis, b- and a-axis, and b- and c-axis are shown in Fig. 1 (b). In Fig. 1 (b), anisotropy of MCPs is clearly shown, which can be related to anisotropy in the wave function of 3d- t_{2g} electrons.

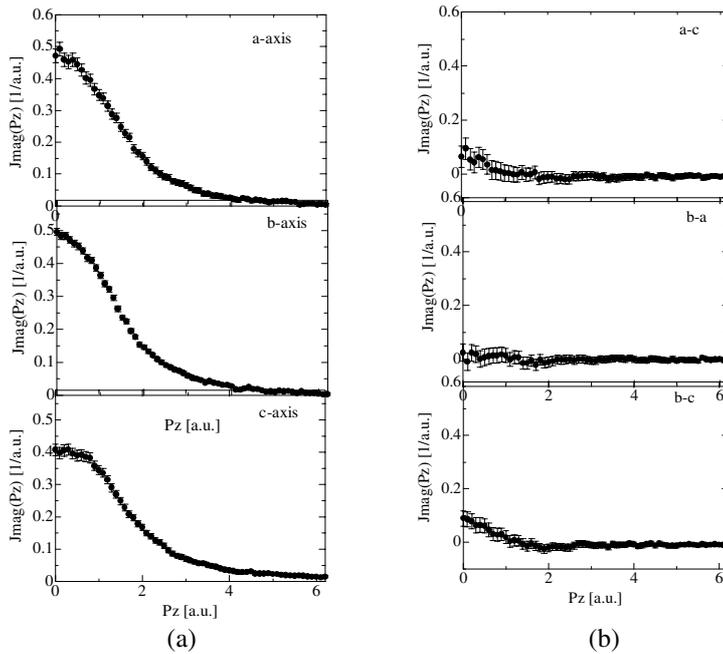


Fig.1
(a) Magnetic Compton Profiles of YTiO_3 along the a,b, and c-axis.
(b) 'a-c', 'b-a', and 'b-c' denote the differences of MCP between a- and c-axis, b- and a-axis, and b- and c-axis respectively