

Anisotropic Resonant X-ray Scattering from Antiferromagnet Hematite, Fe₂O₃

Jun Kokubun^a, Kohtaro Ishida^a, Vladimir E. Dmitrienko^b, ^a*Faculty of Science and Technology, Tokyo University of Science, Japan.* ^b*A. V. Shubnikov Institute of Crystallography, Moscow, Russia.* E-mail: kokubun@ph.noda.tus.ac.jp

Hematite has a corundum structure with antiferromagnetic moments perpendicular to rhombohedral [111] at room temperature. At the Morin temperature ($T_M = 250$ K) their directions change parallel. Anisotropic resonant scattering from hematite was first observed by Finkelstein et al.[1] We have investigated more detailed property of the resonant *forbidden* reflections 111 and 333.[2]

The experiment was carried out near the Fe K-absorption edge with synchrotron radiation source. We measured the energy spectra of the 111 and 333 forbidden reflections intensities. Both spectra show one peak in the pre-edge region and small non-resonant intensity. The azimuthal angle dependence of the forbidden reflections measured at the non-resonant energy shows twofold pattern, which can be explained by non-resonant magnetic scattering. At the resonant energy, however, the azimuth dependence of the 111 reflection shows threefold symmetry. This character is interpreted as a result of interference between electric dipole-quadrupole and quadrupole-quadrupole transition effect. The azimuth dependence of the 333 reflection at the resonant energy scarcely shows threefold symmetry in spite of manifest threefold pattern below the T_M . We conclude that the resonant 333 reflection is affected by resonant magnetic scattering.

[1] Finkelstein K.D., Shen Q., Shastri S., *Phys. Rev. Lett.*,1992, **69**, 1612. [2] Kokubun J., Ishida K., *Photon Factory Act. Rep.*, 2002, **20A**, 21.

Keywords: x-ray resonant scattering, x-ray magnetic scattering, antiferromagnetism