

Resonant X-ray scattering of BaV₁₀O₁₅

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BaV₁₀O₁₅ contains modified V^{2.8+} ($3d^{2.2}$) triangular lattices and shows a structural phase transition at $T_c = 123$ K [1]. Recently, T. Kajita *et al.* found that the trimerization of the V ions occurs below T_c by the powder-diffraction measurements, suggesting the orbital ordering of V t_{2g} states [2].

We investigated the orbital state in BaV₁₀O₁₅ using resonant x-ray scattering (RXS) techniques at the K absorption edge of V. The energy and azimuthal angle dependences of the resonant signal at the reflections of $Q=(0\ 1\ 0)$ and $(0\ 5\ 0)$ were studied. Figure 1 shows the results of the resonant x-ray scattering of BaV₁₀O₁₅. The observed azimuthal angle Ψ and Q dependences are consistent with the orbital ordering model with the V trimerizations.

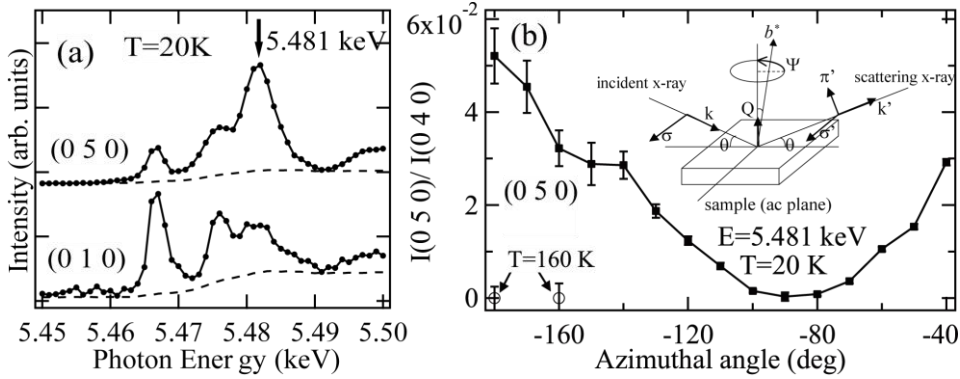


Fig.1 The resonant x-ray scattering spectra of BaV₁₀O₁₅ at $T=20$ K. (a) The energy spectra for the reciprocal position of $(0\ 1\ 0)$ and $(0\ 5\ 0)$. The arrow denotes the main-edge peak of the x-ray scattering. (b) Azimuthal angle dependences of the magnitude at the main-edge peak for $Q=(0\ 5\ 0)$. The inset shows a schematic view of the experimental configuration and definition of the polarization directions.

[1] C. A. Bridges and J. E. Greedan, J. Solid State Chem. 177, 1098 (2004).

[2] T. Kajita *et al.*, Phys. Rev. **B** 81, 060405(R) (2010).