Site Preference of Valence Ions in $Fe_{1+x}Co_{2-x}O_4$ ($0 \le x \le 1$) <u>Takeshi</u> <u>Ohno</u>^a, Norio Shimizu^a, Koichi Ohkubo^a, Takayasu Hanashima^b, Kouji Yamawaki^a, Satoshi Sasaki^a, ^aMaterials and Structure Lab., Tokyo Institute of Technology. ^bPPL, Kusatsu, Shiga, Japan. E-mail: ohno@lipro.msl.titech.ac.jp

Iron cobaltites show the ferrimagnetism to have a spinel structure, where Co and Fe ions occupy tetrahedral A and octahedral B sites in various valence states. Therefore, the determination of cation distribution between the two kinds of sites is indispensable to the interpretation of the magnetic properties of cobaltites.

Fortunately, we succeeded to synthesize single crystals of $Fe_{1+x}Co_{2-x}O_4$ (x = 0.2) by the hydrothermal reaction. The site occupancy of Fe and Co ions was first determined by the singlecrystal synchrotron X-ray diffraction method, where the anomalous scattering effect was used at the Co *K* absorption edge ($\lambda = 1.6182$ Å) in the BL-10A station of the Photon Factory. Then, the electronic information from X-ray absorption near edge structure (XANES) and X-ray magnetic circular dichroism (XMCD) spectra was utilized for determining the valence states of Fe and Co ions. The absorption experiments were performed at both Fe *K* and Co *K* edges at BL-3A. It was found that all Fe ions exist as trivalent ions in Fe *K* XANES spectra, while the valences of Co ions were uniquely obtained from the intensity variation of XMCD signals in the solid solutions [1].

Based on the full determination for x = 0.2 sample, the most plausible chemical formula and magnetic structures have been suggested through the solid solution of Fe_{1+x}Co_{2-x}O₄ ($0 \le x \le 1$).

[1] Kita N., Shibuichi N, Sasaki S., J. Synchrotron Rad., 2001, 8, 446. Keywords: cation distribution, cobalt compounds, x-ray magnetic circular dichroism