Barium hexaferrite BaFe\(_{12}\)O\(_{19}\) is ferrimagnetic and has the strong uniaxial magnetic anisotropy. Substitution of some Fe ions by non-magnetic ions results the reduction of the axial anisotropy along the c axis and it makes the substituted Barium-ferrite an attractive material. Our group has reported in the previous paper that we succeeded to observe a magnetic satellite reflection of BaCoTiFe\(_{10}\)O\(_{19}\) at Fe K edge [1]. The observation verified that the Fe K edge can excite resonantly but indirectly the 3d state of iron and the magnetic resonant enhancement is sufficiently large to study the magnetic order of Fe compounds. In this study we have investigated the magnetic anisotropy change due to the substitution of BaCoTiFe\(_{10}\)O\(_{19}\) by XMCD and RXMS method at Fe K edge. RXMS experiments were carried out at the BL-3A/6C of Photon Factory. X-rays were circularly-polarized by a transmitted-type phase retarder. Diffraction profiles were measured at wavelengths of \(\lambda = 1.7406\) and 1.7390 Å. Low-temperature experiments at \(T = 100\) K were performed with the Oxford Cryostream Cooler. The magnetic structure can be determined based on the difference between observed and calculated asymmetry ratios. The observed asymmetrical ratio \(\Delta R_{av}\) was obtained for 32 Bragg reflections through the RXMS measurements. The \(\Delta R_{av}\) was estimated from the crystal structure factors related to charge, anomalous, magnetic and resonant magnetic scattering terms, based on the structural model. The canting angles of spins were estimated with residual factors of \(\Sigma(\Delta R_{av} - \Delta R_{cal})^2\). The non-collinear spin structure of BaCoTiFe\(_{10}\)O\(_{19}\) and magnetic anisotropy change due to the substitution will be discussed.


Keywords: doped ferrites, magnetic structures, X-ray resonant scattering

**P11.06.14**

Evidence of heterogeneous nucleation of Nd\(_4\)Fe\(_8\)B upon crystallisation of Nd-Fe-B melt-spun ribbons

Jasmine C Shih\(^1\), Philip N.H. Nakashima\(^1\), Kiyonori Suzuki\(^1\), Joanne Etheridge\(^1\)

\(^1\)Department of Materials Engineering, Monash University, Clayton, Victoria, 3800, Australia, \(^2\)Monash Centre for Electron Microscopy, Monash University, Victoria 3800, Australia.

This work studies the crystallisation behaviour of melt-spun Nd\(_4\)Fe\(_8\)B$_{12}$ nanocomposite magnets. Previous studies [1, 2] showed that the formation of Nd\(_4\)Fe\(_8\)B can be promoted by flash annealing. Our study suggests that an orientation relationship exists between the Nd\(_4\)Fe\(_8\)B and t-Fe\(_3\)B. An example of this is shown in Fig. 1. Several other interfaces were examined to consolidate our finding that the orientation relationship of \(<110\>\text{t-Fe}\(_3\)B/\(<110\>\text{Nd}\(_4\)Fe\(_8\)B exists in the flash annealed ribbon. A similar orientation relationship was previously reported by Tomida et al. [3]. Our work confirms that Nd\(_4\)Fe\(_8\)B forms via heterogeneous nucleation and that its orientation is related to t-Fe\(_3\)B.


Keywords: ferrites, resonant scattering, cation distribution

**P11.06.15**

Resonant X-ray scattering study on the cation distribution of BaTiFe\(_{10}\)O\(_{19}\) (A=Mn,Co)

Yuya Ishida\(^1\), Taiki Nakamishi\(^1\), Takeshi Toyoda\(^1\), Maki Okube\(^1\), Satoshi Sasaki\(^1\),

\(^1\)Tokyo Institute of Technology, Department of Materials Science and Engineering, 4259, Nagatutta-cho, Midori-ku, Yokohama, Kanagawa, 226-8503, Japan, \(^2\)Industrial Research Institute of Ishikawa (2-1, Kuratsuki, Kanazawa, Ishikawa, 920-8203, Japan), E-mail: isida@lipro.msl.titech.ac.jp

The site occupancy of Ti, Mn, Fe and Co ions among five independent Fe sites of M-type barium hexaferrites has been reported by Tomida et al. [2]. We thank Martin Saunders, CMCA, the University of Western Australia.


Keywords: doped ferrites, magnetic structures, X-ray resonant scattering

**C511**