phys. stat. sol. (b) **241**, No. 7, 1736–1739 (2004) / **DOI** 10.1002/pssb.200304633

Site occupancy and anisotropy distribution of Al substituted Ba-ferrite with high coercivity

Dong Hyeok Choi, Sung Yong An, Sang Won Lee, In-Bo Shim, and **Chul Sung Kim**[*]

Department of Physics, Kookmin University, Seoul 136-702, Korea

Received 15 November 2003, revised 16 March 2004, accepted 25 March 2004
Published online 18 May 2004

PACS 75.30.Gw, 75.50.Vv, 76.80.+y

The site occupancy and anisotropy distribution of Al substituted $BaFe_{12-x}Al_xO_{19}$ ($0.0 \le x \le 4.0$) have been studied with Mössbauer spectroscopy, X-ray diffraction, and vibrating sample magnetometry. The results suggest that the coercivity, magnetization, and magnetocrystalline anisotropies are closely related to the distributions of Al^{3+} ions on the five iron sites. Mössbauer spectra indicated that Al^{3+} ions have a strong preference for the $4f_1$, $2a$ and $12k$ sites. The substitution of Al^{3+} by Fe^{3+} in the system causes a drastic reduction of the saturation magnetization while the coercivity first increases to 8.6 kOe, for $x = 2.0$, and then decreases to 6.9 kOe, for $x = 4.0$. The origin of the changes in the magnetic properties caused by Al^{3+} substitution can be attributed to the site preferences.