Effects of additives on magnetic properties of sheet Sr-Ba ferrite magnets

Young Jei Oh, In Bo Shim, and Hyung Jin Jung
Division of Ceramics, Korea Institute of Science and Technology, Seoul 130-650, Korea

Jae Yun Park
Department of Materials Science and Engineering, University of Inchon, Inchon 402-749, Korea

Seung Iel Park, Young Rang Um, Young Jong Lee, Seung Wha Lee, and Chul Sung Kim
Department of Physics, Kookmin University, Seoul 136-702, Korea

$Sr_{0.75}Ba_{0.25}Fe_{12}O_{19}$ hexagonal ferrite has attracted much attention due to its large $(BH)_{MAX}$ values and workability. We have prepared sheet magnets by the Dr. Blade method. To examine the effects of additives, such as SiO_2, TiO_2, Al_2O_3, and Cr_2O_3, on magnetic properties of sheet magnets, we used VSM magnetometer, x-ray diffraction, and Mössbauer spectrometer. The crystal structure is found to be a magnetoplumbite of typical M-type hexagonal ferrite, but the α-Fe_2O_3 phase develops with increasing additives concentration. Using our refined computer program, we have analyzed the Mössbauer spectra in the temperature range from 13 to 800 K. The Mössbauer spectra indicate that the line intensity for the 12k site is reduced with increasing SiO_2 concentration, which is different from the reports of Fe-substituted Ba ferrite. This suggests that the developing α-Fe_2O_3 phase is related to 12k sites. The isomer shifts show the charge states of Fe ions is ferric. When the additives concentrations increase, the Curie temperatures, T_c go down. One sextet for α-Fe_2O_3 phase still persists above T_c, so it suggests that the high-T_c values do not result from α-Fe_2O_3. While Al_2O_3 and Cr_2O_3 additives increase coercive force H_c, the other additives reduce it.