

## Investigation of Spin Reorientation in Ga Substituted Y-type Hexaferrite based on Mössbauer Spectroscopy

Jung Tae LIM

*Powder and Ceramic Division, Korea Institute of Materials Science, Changwon 51508, Korea*

Jeonghun KIM and Chul Sung KIM\*

*Department of Physics, Kookmin University, Seoul 02707, Korea*

(Received 18 October 2018, in final form 7 November 2018)

The polycrystalline sample of  $\text{Ba}_2\text{Co}_{1.5}\text{Mg}_{0.5}\text{Fe}_{11.88}\text{Ga}_{0.12}\text{O}_{22}$  Y-type hexaferrite, doped with Ga-cation, was prepared by using the solid-state reaction method. The crystalline structure of sample was investigated by x-ray diffractometer (XRD), and the magnetic properties of sample were measured by vibrating sample magnetometer (VSM), and Mössbauer spectrometer. The crystal structure of prepared sample was determined to be rhombohedral with space group  $R\bar{3}m$ . From the temperature dependence of the magnetization curves under 100 Oe between 4.2 and 740 K, two temperature-dependent magnetic transitions occurred in the  $\text{Ba}_2\text{Co}_{1.5}\text{Mg}_{0.5}\text{Fe}_{11.88}\text{Ga}_{0.12}\text{O}_{22}$  sample. Mössbauer spectra of the sample were analyzed at various temperatures ranging from 4.2 to 620 K, and the  $\text{Ba}_2\text{Co}_{1.5}\text{Mg}_{0.5}\text{Fe}_{11.88}\text{Ga}_{0.12}\text{O}_{22}$  sample showed abrupt changes in  $H_{\text{hf}}$  and  $E_{\text{Q}}$  at 200 K, indicating the spin transition effect. We have also determined the magnetic transition temperature  $T_{\text{C}}$ , in addition to the temperature dependent magnetization and ZFC measurements.

PACS numbers: 76.80.+y, 75.60.Ej, 85.75.-d

Keywords: Y-type hexaferrite, non-magnetic doped hexaferrite, spin transition, Mössbauer spectroscopy

DOI: 10.3938/jkps.73.1708