Site Preference for Fe in Zn-Doped Y-Type Barium Hexaferrite

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Polycrystalline $Ba_2Zn_xCo_{2-x}Fe_{12}O_{22}$ samples were prepared by solid state reaction method. The crystallographic structure and magnetic properties of the Zn-doped Y-type hexaferrite samples were investigated by X-ray diffraction, magnetization, and Mössbauer spectroscopy measurements. The crystal structure was found to be hexagonal with space group of $R-3/m$. The lattice constants of the samples increased as Zn contents increase. From the temperature dependence of magnetization, measured from 50 to 700 K, the magnetic transition temperature (T_S, T_C) of $Ba_2Zn_xCo_{2-x}Fe_{12}O_{22}$ decreased with increasing Zn concentration. Mössbauer spectra of $Ba_2Zn_xCo_{2-x}Fe_{12}O_{22}(x = 0, 1)$ were obtained at various temperature ranging from 4.2 to 300 K. Based on the observed spectra, the site occupancies in six interstitial sites of Co, Zn and Fe ions were calculated from the average of the relative sub-spectra absorption areas. Increasing Zn contents, the Debye temperature of the samples decreased. The isomer shift values of the samples at various temperatures were $0.1 < \delta < 0.45$ mm/s, relative to the Fe metal, which were consistent with the Fe^{3+} valance state.

Index Terms—**Ferrimagnetic, hexaferrite, Mössbauer, Y-type ferrite.**