

Magnetic Properties and Hyperfine Interaction of $\text{BaSrCo}_2(\text{Fe}_{1-x}\text{Al}_x)_{12}\text{O}_{22}$ Hexaferrite

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Polycrystalline $\text{BaSrCo}_2(\text{Fe}_{1-x}\text{Al}_x)_{12}\text{O}_{22}$ ($x = 0.00, 0.01, 0.05, \text{ and } 0.10$) samples were synthesized by polymerizable complex method. Based on the Rietveld refinement, crystal structures of the samples were found to be single-phased and determined to be rhombohedral with space group of $R\bar{3}m$. The hysteresis curves of the samples were measured under 15 kOe at various temperatures ranging from 4.2 and 295 K. It shows that they were not saturated with increasing Al ion contents due to the reduction of magnetic anisotropy. $M_{15\text{kOe}}$ was decreased with increasing Al ions contents. We expect that non-magnetic Al ions preferentially occupy the up-spin site of $18h_{\text{VI}}$, $3b_{\text{VI}}$, and $3a_{\text{VI}}$. The Mössbauer spectra of the samples were obtained at 295 K, and analyzed with six-sextets for Fe sites corresponding to the Y-type hexaferrite crystallography sites. The $\langle E_{\text{Q}} \rangle$ shows abrupt changes, and the $\langle H_{\text{hf}} \rangle$ shows abrupt decreases around $x = 0.05$ due to the coexistence of magnetic secondary phases.

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