

Mössbauer Studies of Y-type Hexaferrite with Aluminum Doping

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The crystal structures of polycrystalline $\text{Ba}_2\text{Co}_{1.5}\text{Mg}_{0.5}(\text{Fe}_{1-x}\text{Al}_x)_{12}\text{O}_{22}$ ($x = 0.00, 0.01, 0.02$) samples were determined to be rhombohedral with a space group of $R-3m$. From the temperature-dependent magnetization curves under 100 Oe, all samples showed helimagnet-to-ferrimagnet transitions. Based on the applied-field-dependent magnetization measurements up to 10 kOe at 295 K, the saturation magnetization (M_s) and coercivity (H_c) of $\text{Ba}_2\text{Co}_{1.5}\text{Mg}_{0.5}(\text{Fe}_{1-x}\text{Al}_x)_{12}\text{O}_{22}$ ($x = 0.00, 0.01, 0.02$) samples were found to be $M_s = 28.0, 24.7, 23.4$ emu/g and $H_c = 255.4, 222.0, 196.2$ Oe, respectively. Also, from the Mössbauer spectra of 295 K, the isomer shift values of all samples indicate charge states of Fe^{3+} . We expect that the decrease in the M_s with increasing Al ion doping is due to the fact that Al ions preferentially occupy the $3b_{VI}$, $18h_{VI}$ and $3a_{VI}$ octahedral sublattices, which are up-spin sites.

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