

A Study of Co Substituted Mn-Ferrite, $\text{Mn}_{1-x}\text{Co}_x\text{Fe}_2\text{O}_4$ ($x = 0.0, 0.5, 1.0$)

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The $\text{Mn}_{1-x}\text{Co}_x\text{Fe}_2\text{O}_4$ ($x = 0.0, 0.5, 1.0$) materials were prepared by the high-temperature thermal decomposition method and studied for its unique magnetic phenomena of magnetic nanoparticles. The crystal structure is found to be an inverse cubic spinel with a space group of $Fd-3m$ and the lattice constants (a_0) of 8.432, 8.486, and 8.466 Å, respectively. The samples show magnetization (M_s) of 54.2, 29.4, and 46.9 emu/g, respectively. Also, the coercivities (H_c) of all samples are 32.4, 86.9, and 90.7 Oe, respectively. Mössbauer spectra of all samples were obtained at various temperatures. Mössbauer spectra show a ferrimagnetic state of six-line having the hyperfine field (H_{hf}) values of 456, 472, and 475 kOe for the tetrahedral sites and 400, 422, and 430 kOe for the octahedral sites, respectively, which increases with doping Co concentration.

Index Terms—Cobalt ferrite, high-temperature thermal decomposition (HTTD), manganese ferrite, Mössbauer spectroscopy.