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Effects of In^{3+} site occupancy on the magnetic properties of M-type strontium hexaferrites

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ABSTRACT

Effects of nonmagnetic indium ion substitution on magnetic properties of M-type strontium hexaferrites $SrFe_{12-x}In_xO_{19}$ (x=0, 0.25, 0.5, 0.75, and 1) have been studied by crystallographic and magnetic measurements. Samples were prepared by citric auto-combustion method. Rietveld analysis of X-ray diffraction profiles showed that the samples were single phase with the space group $P6_3/mmc$ and lattice constants a and c increased linearly with In^{3+} content. Mössbauer spectra showed that In^{3+} mainly replaced Fe^{3+} ions in $4f_2$ sites and that $12k$ subspectra split into two distinct components $12k_1$ and $12k_2$. Analysis of hysteresis curves showed that while the coercive force and the magnetic anisotropy constant decreased thru the whole doping range x, the saturation magnetization first increased until x=0.5 and decreased thereafter. This behavior was explained by the existence of two competing interactions in terms of nonmagnetic indium substitution.