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Influence of manganese substitution on structural and magnetic properties of CoFe_2O_4 nanoparticles

N. Adeela^{a, b}, K. Maaz^{b, d *}, U. Khan^c, S. Karim^b, A. Nisar^b, M. Ahmad^b, G. Ali^b, X. F. Han^c, J.L. Duan^d, J. Liu^d

^aCenter for High Energy Physics, University of the Punjab, Lahore 54000, Pakistan

^bNanomaterials Research Group, Physics Division PINSTECH, Nilore 45650, Islamabad, Pakistan

^cInstitute of Physics, Chinese Academy of Sciences, Beijing 100190, China.

^dInstitute of Modern Physics, Chinese Academy of Sciences, Lanzhou 730000, China

Abstract

Nanocrystalline ferrites with general formula of $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$ ($0 \leq x \leq 1$) have been synthesized via wet chemical coprecipitation technique. Structural and magnetic investigations were performed at room temperature. The results revealed the formation of single phase Mn-substituted CoFe_2O_4 nanoparticles with crystallite sizes in the range 12-15 nm. An increase in lattice parameter and decrease in X-ray density were observed with increasing Mn concentration in CoFe_2O_4 . FTIR results showed two (vibrational) frequency bands (ν_1 and ν_2) for tetrahedral and octahedral sites confirming the formation of spinel ferrite. Magnetic measurements showed increasing behavior of both coercivity and saturation magnetization of cobalt ferrite up to 20-30% manganese concentration followed by a monotonic decrease in these parameters for higher Mn concentrations.

Key words: Ferrite Nanoparticles, Coprecipitation, Magnetic properties,

Correspondence: maaz@impcas.ac.cn (K. Maaz)

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