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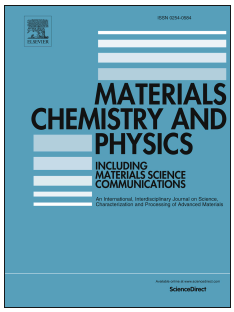

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Influence of Neodymium and gamma rays irradiation on structural electrical and magnetic properties of Co-Zn nanoferrites

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Abstract

Nanostructured $Co_{1-x}Zn_xNd_yFe_{2-y}O_4$ ($0 \leq x \leq 1.0$; y = 0.0 and 0.1) ferrites were synthesized through combustion route. All the compositions were irradiated with ^{60}Co gamma with total exposure dose 310 kGy at the dose rate 6.1kGy/h. The virgin and irradiated nanoparticles were characterized by the techniques; XRD, FTIR, SEM and EDAX. The DC electrical conductivity was measured in temperature range 300–800K. Magnetic parameters were measured with vibrating sample magnetometer (VSM) at 300K. Characterization studies reveal the structure, size, morphology and composition of the nanoferrites. The x-ray diffraction analysis revealed the cubic spinel ferrite structure. The characteristic feature of nanoferrites was confirmed by two prominent absorption bands ν_1 and ν_2 in the range 566-607 cm^{-1} and 401-498cm^{-1}. The SEM micrographs evidenced almost spherical shaped agglomerated grainy structure of nanoferries. DC conductivity studies revealed that Curie temperature (T_C) decreased with increasing Zn^{2+} ion and Nd^{3+} ion substitution due to the weakening of A–B interaction. The observed enhancement of DC conductivity and magnetic parameters on γ-irradiation attributed to the rearrangement of cations at A-site and B-site in the lattice.

Keywords: Nanoferrites, Gamma irradiation, structural properties, magnetic properties.

1. Introduction

Nanotechnology is the design, synthesis, application of materials and devices whose size and shape have been engineered at nanoscale. The unique properties of nanostructured materials