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Abstract:

Nano-crystalline nickel ferrites are interesting materials due to their large physical and magnetic properties. In the present work, two kinds of spinel ferrites $Ni_{0.8}M_{0.2}Fe_2O_4$ (M=Cu, Co) are synthesized by using sol-gel auto-combustion method and the results are compared with $NiFe_2O_4$. The structural properties of synthesized ferrites are determined by using x-ray powder diffraction; scanning electron microscope and Fourier transform infrared spectroscopy. The cation distribution obtained from X-ray diffraction show that cobalt/copper occupies only tetrahedral site in spinel lattice. The lattice constant increases with the substitution of cobalt/copper. The structural parameters like bond lengths, tetrahedral and oct ahedral edges have been varied with the substitution. The microstructural study is carried out by using SEM technique and the average grain size is increased with nickel ferrite. The initial permeability (μ_i) is improving with the substitution. The observed g-value from ESR is approximately equal to standard value.

Keywords: X-ray diffraction, initial permeability, spinel structure, ESR

Introduction:

Nano-crystalline spinel ferrites attracted special attention in the field of electronic technology because of their wide applications ranging from microwave to radio wave frequencies. Spinel ferrites are made up of a regular combination of oxygen with the general formula AB_2O_4. The most common type cubic spinel ferrites contain tetrahedral (A site) and octahedral (B site) crystalline sites the cations are distributed among tetrahedral and octahedral sites for their comfortable fit. The magnetic and electrical properties of ferrite could be easily tuned by incorporation and suitable distribution of additional cations in the spinel structure. Nickel ferrite ($NiFe_2O_4$) has wide applications in various fields created an interest to study the electric and magnetic properties such as high saturation magnetization, stability, resistivity and low loss energy over a wide range of frequency. Copper and cobalt are the nonmagnetic divalent metal ion doped with nickel ferrite is of interest in fundamental and applied research. The substation (substitution) of copper and cobalt in nickel ferrite