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Structural and Magnetic Studies of Zn Doped Nickel Nanoferrites Synthesize by Sol-gel Auto Combustion Method

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Abstract

A series of nanoferrites with chemical composition $Ni_{1-X}Zn_XFe_2O_4$ (X=0.0 to 1.0) have been prepared by novel microwave assisted sol-gel auto-combustion method. Structural study was performed using XRD technique revealed prepared samples has single spinel phase. Precise value of lattice parameter was determined by plotting lattice parameters versus Nelson-Riley function. The value of lattice parameter shows increasing trend with content of Zn. This behaviour of lattice parameter is due to difference in ionic radii of Zn and Ni. The values of crystallite size, experimental density, theoretical density, porosity, ionic radii, bond length and hopping length at tetrahedral (A) and octahedral (B) sites were measured from XRD data. The crystallite size of nanoparticles form XRD data is in the range 17 - 25 nm. The microstructure was also characterized by scanning electron microscopy. The magnetic behaviour was understood from B-H loop obtained using Vibrating Sample Magnetometer (VSM). It is observed that the magnetic properties change with the increase of Zn content and can be interpreted on the basis of Neel"s two sub lattice model.

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>
> …It is observed from EDS investigation that there is no other elemental impurity is found. Vibrational spectroscopy could be utilized to identify the stretching and bending vibrations of tetrahedral and octahedral complexes of spinel structures, as well as the molecular structure of organic molecules. [17]. The FTIR spectra of synthesized samples at 160°C, 180°C, and 200 °C are shown in Figure 9.…

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