Structural and Magnetic Properties of Ti Doped Nickel Ferrite Solid Solutions

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Abstract

Ferrimagnetic spinel ferrites are important magnetic materials, which are widely used in high-frequency devices, because of their high permeability in the radio frequency region, high electrical resistance, mechanical hardness and chemical stability. The chemical formula for spinel ferrites is MFe_2O_4, where M is any divalent transition metal ion. In this structure oxygen ions form face centred cubic lattice and the metal ions are surrounded by either 4 (Tetrahedral) or 6 (Octahedral) oxygen ions. They are composed of iron oxide and one or more other metals in chemical combination. The most important properties of ferrites include high magnetic permeability and high electrical resistance. High permeability to magnetic fields is particularly desirable in devices such as antennas. High resistance to electricity is desirable in the cores of transformers to reduce eddy currents. Ferrites are primarily used as inductive components in a large variety of electronic circuits such as low-noise amplifiers, filters, voltage-controlled oscillators, impedance matching networks.

Spinel Nickel ferrites $Ni_{1-x}Ti_xFe_2O_4$ (where x= 0, 0.1, 0.2) have been prepared by solid state reaction route through doping of Ti ions at A-site. The structural analysis of prepared samples has been done by X-Ray Diffraction technique which reveals single phase cubic system. The magnetic properties of samples are studied by Vibrating Sample Magnetometery (VSM). The Saturation magnetisation and Coercivity of A site Ti doped nickel ferrite are taken at room temperature show regular variation with increase in molar concentration.

Keywords

Ti Doped Nickel Ferrite, Structural Analysis, Vibrating Sample Magnetometery (VSM)