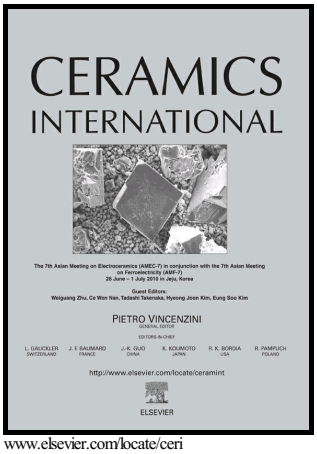

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Effect of Neodymium ion on the Structural, Electrical and Magnetic Properties of Nanocrystalline Nickel Ferrites

N. Lenin[1], K. Sakthipandi[1]*, R. Rajesh Kanna[1], J. Rajesh[2]

[1]*Department of Physics, Sethu Institute of Technology, Kariapatti 626 115, Tamil Nadu, India*

[2]*Chemistry Research Centre, Mohamed Sathak Engineering College, Kilakarai 623 806 Tamilnadu, India*

Abstract

$NiNd_xFe_{2-x}O_4$ nanoferrites with different compositions of x=0.01, 0.03, 0.05, 0.07 and 0.09 were prepared using the sonochemical method. The structural, optical and morphological properties of the prepared nanoferrites were characterized by X-ray diffraction, ultra violet-diffuse reflectance spectroscopy, scanning electron microscopy and X-ray fluorescence techniques. The X-ray diffraction analysis of the prepared nanoferrites confirmed the presence of a cubic spinel structure. The average crystallite sizes of the prepared nanoferrites were 52, 49, 46, 44 and 40 nm for x=0.01, 0.03, 0.05, 0.07 and 0.09, respectively. The particle size of the prepared $NiNd_xFe_{2-x}O_4$ nanoferrites was in the range 60-40 nm. The dielectric parameters ranged from 2.9 GHz to 5.6 GHz. Decrease in the dielectric constant was observed with an increase in Nd^{3+} ions in the prepared $NiNd_xFe_{2-x}O_4$ nanoferrites. However, a reverse trend was observed in the dielectric loss. An impedance analysis of the prepared nanoferrites was carried out to explore the pseudo-capacitance behavior. The saturation magnetization and remnant magnetization values of the prepared nanoferrites decreased with an increase in the concentration of Nd^{3+} ions in $NiNd_xFe_{2-x}O_4$ nanoferrites.

Keywords: Nanoferrites, Optical properties, Dielectric constant, Magnetic properties, Impedance

*Corresponding author, Tel.: +91 4566 308001-04

*Fax: +914566-308006