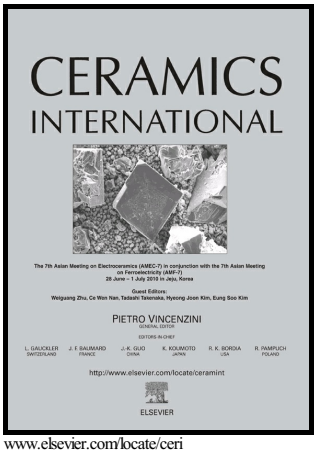


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# Structural, Spectral, Dielectric and Magnetic Properties of $Ni_{0.5}Mg_xZn_{0.5-x}Fe_2O_4$ Nanosized ferrites for Microwave absorption and High Frequency Applications

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**Abstract**

$Ni_{0.5}Mg_xZn_{0.5-x}Fe_2O_4$ (x=0, 0.1, 0.2, 0.3, 0.4 and 0.5) (NiMgZn) nano-sized ferrites were synthesized via sol-gel route. The average cation radius, bond lengths (A and B sites), shared ($d_{AE}$, $d_{BE}$) and unshared edges ($d_{BEU}$) of the NiMgZn nanoferrites were determined from the XRD data. FTIR studies confirmed the spinel structure of NiMgZn nanoferrites. The force constant at tetrahedral and octahedral sites were calculated. The surface morphology was investigated from the micrographs. The dielectric parameters such as dielectric constant, dielectric loss factor, loss tangent and Q values with different concentration of Mg in NiZn nanoferrite were evaluated. It was found that the NiMgZn sample at x=0.5 showed high Q values with low dielectric losses at higher frequencies. The squareness ratio and coercivity values confirmed the super paramagnetic behaviour of the NiMgZn nano-sized ferrites. However, the saturation and remanence increased with the increasing Mg contents whereas coercivity values follow the Stoner-Wolforth model for NiMgZn at x=0, 0.2, 0.3 and 0.4. The NiMgZn nano-sized ferrites samples at x=0.1 and 0.5 show the variations in coercivity values which may be due to the strong LS coupling and super-exchange interactions of the metal cations at tetrahedral and octahedral sites. The dielectric and magnetic studies of NiMgZn nano-sized ferritesexplored their application in various technological and industrial fields such as magnetic storage, microwave absorption and high frequency applications.

**Keywords:** Nanoferrites; X-Ray Diffraction; Fourier Transform Infrared Spectroscopy; Scanning Electron Microscopy; Dielectric and Magnetic Properties.

## 1. Introduction

Spinel nanoferrites have been attracted by the scientist and researchers because of their excellent dielectric and magnetic characteristics. These nanoferrites have been used in many technological and industrial applications such as data storage, magnetic recording, electronic chips, sensing application, bio medical application, adsorption, surface mounting devices, inductors, filters, converters, suppressors and magneto