

Abstract 18 – Paper ID: 122**Zinc substituted Nickel Copper ferrite ceramics: A study on structural, magnetic and dielectric properties**

Susmita Salam¹, Ibetombi Soibam¹

¹Department of Physics, National Institute of Technology Manipur, Langol, Imphal-795004, Manipur, India

Email: susmita.salam135@gmail.com

Abstract

Zinc substituted Nickel Copper ferrite ceramics (ZNC) with the structural formula $\text{Ni}_{(0.7-x)}\text{Cu}_{0.3}\text{Zn}_x\text{Fe}_2\text{O}_4$, where $x = 0, 0.1, 0.2$ and 0.3 were synthesized using citrate precursor auto-combustion method. The prepared samples were calcined at 550°C using microwave furnace for 30 minutes at a heating rate of 10°C per minute. The calcined samples were pelletized using PVA as binder and sintered at 600°C in the microwave furnace for 30 minutes with the same heating rate. Sintered samples were characterized for their structural, magnetic and dielectric properties using X-ray diffraction, FTIR spectra, VSM and LCR meter, respectively. X-ray diffractogram confirmed the spinel phase formation of all the samples. Average crystallite sizes of all the samples were found out from the X-ray diffractogram using Scherrer's formula. The average crystallite size decreases with increasing Zn concentration. Lattice constant and theoretical density of the samples were obtained from the X-ray diffractogram using Rietveld refinement technique. FTIR spectra showed the presence of various metal-oxygen bonds present in the samples supporting the XRD. VSM results shows the soft magnetic nature of the samples. Further, dielectric properties such as dielectric constant and dielectric loss of the sintered samples were studied at room temperature as a function of frequency in the range of 20 Hz–2 MHz. Here, the dielectric constant and dielectric loss showed normal dispersive behaviour of ferrites in the considered frequency range. The variation of dielectric constant and dielectric loss with increasing concentration of Zinc substitution were also studied. Possible mechanisms of all the results obtained were discussed.

Keywords: Ni-Cu-Zn ferrite, Microwave, XRD, Saturation magnetization, Dielectric constant, Dielectric loss