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OBSERVATION OF DIELECTRIC AND MAGNETIC POLARIZATIONS IN $Ni_{0.3}Zn_{0.7}Fe_2O_4$ VIA COMPLEX-PLANE PLOTS

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ABSTRACT

Studies in dielectrics have been carried out for decades and have been numerously reported in the literature such as the frequency response of dielectric component, ε', ε'' and the well known cole-cole plot in which ε'' is plotted against ε'. Hence, guided by the dielectric cole-cole plot, we have proposed to study the magnetic parameter variation of μ'' vs μ'. Polycrystalline nickel zinc ferrite of composition $Ni_{0.3}Zn_{0.7}Fe_2O_4$ has been prepared by using the conventional solid state method. The frequency dependence of the dielectric constant, ε', and the dielectric loss, ε'', were determined in the frequency range from 1MHz to 1GHz for disc-shaped samples sintered at different temperatures: 1260°C, 1300°C and 1340°C. Dielectric complex-plane permittivity plots are now reported as the relation between the dielectric loss, ε'', and the dielectric constant, ε', over the entire frequency range. The real part of magnetic permeability, μ', and the imaginary part of the permeability, μ'', were also measured for toroid-shaped ferrite samples as a function of frequency between 1MHz to 1GHz , the samples having been sintered at 1260°C, 1300°C and 1340°C. Using the dielectric complex-plane plots as the guide, magnetic complex-plane plots were obtained for the imaginary part, μ'', versus the real part, μ', of the permeability. It is suggested that these magnetic analogues of the dielectric complex-plane have a strong potential of being exploited to yield details of magnetic polarization.

Keywords: nickel zinc ferrite; dielectric complex-plane; magnetic complex-plane

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