Effect of Dy Substitution on the Structural, Electrical and Magnetic Properties of $Mg_{0.4}Cu_{0.2}Zn_{0.4}Fe_2O_4$ Ferrites

Speaker: Mahmudul Hassan

Abstract

The effect of Dy substitution on the structural, electrical and magnetic properties of Mg-Cu-Zn ferrites having the composition $Mg_{0.4}Cu_{0.2}Zn_{0.4}Dy_xFe_{2-x}O_4$ (where x =0.0, 0.01, 0.02, 0.03 and 0.04) have been studied along with the microstructural evolution for all the samples. The X-ray diffraction patterns confirmed the single phase cubic spinel structure up to x = 0.02. However, a small peak of $DyFeO_3$ is coexists with the cubic spinel structure for x > 0.02. Fourier transforms infrared absorption bands of $Mg_{0.4}Cu_{0.2}Zn_{0.4}Dy_xFe_{2-x}O_4$ demonstrates that the frequency band appeared in the high frequency (548 - 555 cm^{-1}) which is attributed to the stretching vibrations, while the band appeared in the low frequency (352 - 355 cm^{-1}) which is related to bending vibrations. The values of saturation magnetizations for Dy substituted Mg-Cu-Zn ferrites are reduced as compared to pure Mg-Cu-Zn ferrites. The complex magnetic permeability spectrum has displayed that the initial permeability is higher at x= 0.02, which could be ascribed to the densification of the sample along with the larger grain size. The dielectric property of the samples displayed dispersive behavior following the Maxwell-Wagner type of polarization. The Cole-Cole plot has shown a single semicircular arc, which indicates that the conduction mechanism is mostly through the grain property.