

Magnetic and dielectric properties of polycrystalline $\text{Co}_{0.5}\text{Ni}_{0.5}\text{Fe}_2\text{O}_4$ materials prepared using mechanically alloyed nanoparticles.

Abstract

Cobalt–nickel ferrite ($\text{Co}_{0.5}\text{Ni}_{0.5}\text{Fe}_2\text{O}_4$) were prepared using a high energy milling and sintering. The starting raw materials of NiO, Co_3O_4 and Fe_2O_3 were subjected to 12 hr milling using a Spex8000D mixer/mill. The resulting material was molded into samples of toroidal/disc shape and subsequently sintered at various temperatures from 600 to 1000° C, at 100° C interval. The effect of sintering temperature on microstructure, saturation magnetization (M_s), and coercivity (H_c) was reported. The frequency dependence of the magnetic and dielectric properties such as permittivity, loss tangent, permeability and loss factor were investigated in the frequency range of 10 MHz–1.8 GHz. The results show that the real part of the permittivity at individual temperatures was constant within the measured frequency, while the loss tangent values decreased gradually with increasing frequency. The real permeability on the other hand remained fairly constant over certain frequency (around 1.0 GHz), and thereafter increases towards saturation thereby showing a good potential in the microwave frequencies region.

Keyword: Mechanical alloying; Dielectric properties; Magnetic properties; Sintering temperatures.