

Sintering temperature dependence of room temperature magnetic and dielectric properties of $\text{Co}_{0.5}\text{Zn}_{0.5}\text{Fe}_2\text{O}_4$ prepared using mechanically alloyed nanoparticles

Abstract

$\text{Co}_{0.5}\text{Zn}_{0.5}\text{Fe}_2\text{O}_4$ nanoparticles were prepared using mechanical alloying (MA) and sintering. The crystallite size, coercivity, retentivity and saturation magnetization were also measured. The frequency dependence of dielectric and the magnetic parameters, namely, real permittivity ϵ' , loss tangent $\tan \delta$, real permeability μ' and loss factor μ'' were measured at room temperature for samples sintered from 600 to 1000 °C, in the frequency range 10 MHz to 1.0 GHz. The results show that the crystallite size of the resulting products ranges between 16 and 67 nm for as-milled sample and the sample sintered at 1000 °C, respectively. The sample sintered at 1000 °C, measured at room temperature exhibited a saturation magnetization of 37 emu g⁻¹. The values of permittivity remain constant within the measured frequency, but vary with sintering temperature. The permeability values, on the other hand however vary with both the sintering temperature and the frequency, thus, the absolute value of the permeability decreased after the natural resonance frequency.

Keyword: Mechanical alloying; Sintering temperature; Permeability; Permittivity; Nanoparticles