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Magnetic properties of NiCuZn ferrite nanoparticles synthesized using egg-white

(2010) *Materials Research Bulletin*, 45 (5), pp. 589-593.

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Abstract

A new process to prepare single-phase nano-sized ferrites, $\text{Ni}_{0.8-x}\text{Cu}_{0.2}\text{Zn}_x\text{Fe}_2\text{O}_4$ with $x = 0.1-0.7$, was developed using egg-white precursors. TG measurement showed that, the precursors must be calcined at 550 °C. XRD patterns indicated the formation of single-phase cubic ferrites with particle size in the range 28.7-48.4 nm. TEM image gave particle size agrees well with that estimated using XRD. FT-IR spectroscopy showed the characteristic ferrite bands. Hysteresis loops measurements exhibited an increase in the saturation magnetization value (M_s) up to zinc content of 0.2 followed by unexpected decrease, which suggests the preference of Zn^{2+} ions to occupy octahedral sites. The decrease in the coercivity (H_c) with increasing zinc content is attributed to the lower magneto-crystalline anisotropy of Zn^{2+} ions compared to Ni^{2+} ions. Temperature dependence of the molar magnetic susceptibility (χ_M) suggested a ferrimagnetic behavior of the investigated samples and showed a decrease in the value of the Curie temperature (T_C) with increasing zinc. © 2010 Elsevier Ltd. All rights reserved.

Author Keywords

A. Magnetic materials; C. FT-IR; C. TGA; C. XRD; D. Magnetic properties

ISSN: 00255408

CODEN: MRBUA

DOI: 10.1016/j.materresbull.2010.01.021

Document Type: Article