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Effect of Mg substitution on the magnetic properties of NiCuZn ferrite nanoparticles prepared through a novel method using egg white

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Abstract

Nanocrystalline Mg-substituted NiCuZn ferrites were successfully synthesized, for the first time, by using metal nitrates and freshly extracted egg white. The thermal decomposition process of the nitrate-egg white precursors was investigated by thermogravimetric (TG) technique. X-ray diffraction (XRD) revealed that, single-phase cubic ferrites with average particle size of 23.9-35.1 nm were directly formed after ignition at 500 °C. No noticeable variation of lattice parameters with increasing magnesium content was observed, while X-ray densities were found to decrease. This can be explained on the basis of ionic radii and atomic masses of the substituted cation. Transmission electron microscope (TEM) shows that, particles are permanently magnetized and get agglomerated. The saturation magnetization (M_s) and coercivity (H_c) as a function of Mg content were investigated using vibrating sample magnetometer (VSM). It has been found that the M_s increases firstly up to $x=0.2$ and then decreases, while H_c continuously decreases. Magnetic susceptibility measurements give results which agree well with those obtained by VSM. The obvious decrease in the Curie temperature (TC) with increasing Mg indicates that the ferrimagnetic grains are widely separated and enclosed by non-magnetic magnesium ions. © 2009 Elsevier B.V. All rights reserved.

Author Keywords

Egg white; Mg substitution; NiCuZn ferrite; Susceptibility; VSM; XRD

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