



Contents lists available at ScienceDirect

Journal of Alloys and Compounds

journal homepage: www.elsevier.com/locate/jallcom



A study on Cu substituted Ni–Cu–Zn ferrites synthesized using egg-white

M.A. Gabal*, Y.M. Al Angari, S.S. Al-Juaid

Chemistry Department, Faculty of Science, King Abdul Aziz University, Jeddah, Saudi Arabia

ARTICLE INFO

Article history:

Received 29 July 2009

Received in revised form
17 November 2009

Accepted 18 November 2009

Available online 22 November 2009

Keywords:

NiCuZn ferrite

Egg-white

XRD

VSM

Susceptibility

ABSTRACT

This paper examines the effect of copper substitution on the structural and magnetic properties in crystalline ferrite series of nominal composition; $\text{Ni}_{0.7-x}\text{Cu}_x\text{Zn}_{0.3}\text{Fe}_2\text{O}_4$ (where $x=0.1-0.6$) synthesized by a simple method using metal nitrates and freshly extracted egg-white. X-ray diffraction measurements (XRD) confirmed the formation of single-phase cubic spinel structure. The average crystallite size was calculated using XRD pattern and confirmed by transmission electron microscope (TEM). The constant lattice parameters obtained with Cu substitution was attributed to the small difference in ionic radius between Ni^{2+} and Cu^{2+} ions. FT-IR spectra showed two absorption bands assigned to tetrahedral and octahedral complexes. The effect of Cu concentration on the magnetic properties was investigated using vibrating sample magnetometer (VSM) and molar magnetic susceptibility measurements. The decrease in the saturation magnetization and the Curie temperature values with increasing Cu content was explained in terms of the magnetic moments and magnetic exchange interaction between the antiparallel uncompensated electron spin of A and B sublattices. The magnetic measurements also proved that the entire preparation method has a great effect on enhancing the magnetic properties of the system.