Structural and Magnetic properties evolution of fine-grained Ni0.5Zn0.5Fe2O4 series synthesized via mechanical alloying.

ABSTRACT

Spinel ferrite powders with a composition of Ni0.5Zn0.5Fe2O4 were prepared by the mechanical alloying method and sintering process. The samples began to shrink at sintering temperatures 500°C-800°C. The increasing trend of average grain size was observed after 900°C and this is consistent with the results obtained for theoretical density (%Dth) and porosity. The drop of the density for 1300°C and 1400°C was due to intragranular pores which can be seen from the SEM micrographs. The activation energy of the sintering temperature for alloyed samples showed a low value compared to the micron size starting powder via the conventional solid state process. The XRD data provided information on the phase purity. A critical region of sintering temperature for the development of magnetic properties was observed at 800°C and 900°C with the sigmoid B-H curve shape taken to indicate a strong magnetic order, it is proposed that the first occurrence of significant ferromagnetism in the samples required that at least three basic conditions have been attained; a pure single phase, sufficiently large grains to support the existence of magnetic domains and a sufficient number of such grains.

Keyword: Mechanical alloying; Sintering temperature; Microstructure evolution.