

A comparative study of different sintering routes effects on evolving microstructure and B–H magnetic hysteresis in mechanically-alloyed Ni–Zn ferrite, Ni_{0.3}Zn_{0.7}Fe₂O₄

ABSTRACT

A comparative study between two sintering routes has been carried out to reveal the parallel evolutions of microstructure and BóH hysteresis in a mechanically-alloyed NióZn ferrite. The starting powders were mixed and crushed via the mechanical alloying technique. Subsequently two portions of the resulting powder were subjected to two respective sintering routes: multi-sample and single-sample. In the multi-sample sintering, the samples were sintered from 600 to 1400 °C with any one sample being subjected to only one sintering temperature. For the single-sample sintering, only a single sample was subjected to repeat sintering from 600 to 1400 °C. In BóH hysteresis measurement, the same trends but with different values were observed for both sintering routes. Saturation induction, Bs, values range from 23.9 to 1076.0 G for multi-sample sintering and from 23.4 to 930.7 G for single-sample sintering. Three distinct behaviour groups could be distinguished which correspond to a particular range of grain sizes and domain state of the samples. The activation energies of grain growth for multi-sample and single-sample sintering show three different ranges of values for each route which are 6.80, 99.31 and 143.39 kJ/mol and 14.60, 29.42 and 162.83 kJ/mol respectively. These different ranges of values characterized the different diffusion mechanisms.

Keyword: Sintering; BóH hysteresis; Ni_{0.3}Zn_{0.7}Fe₂O₄; NióZn ferrite; Mechanical alloying technique