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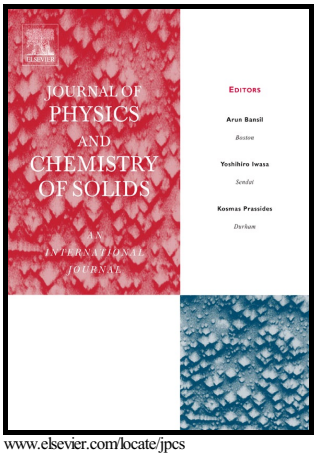

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A comparative study of different concentrations of pure Zn powder effects on synthesis, structure, magnetic and microwave-absorbing properties in mechanically-alloyed Ni–Zn ferrite

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Abstract

In this study, a powder mixture of Zn, Fe_2O_3 and NiO was used to produce different compositions of $Ni_{1-x}Zn_xFe_2O_4$ (x = 0.36, 0.5 and 0.64) nanopowders. High-energy ball milling with a subsequent heat treatment method was carried out. The XRD results indicated that for the content of Zn, x = 0.64 a single phase of Ni-Zn ferrite was produced after 30 h milling while for the contents of Zn, x = 0.36 and 0.5, the desired ferrite was formed after sintering the 30 h-milled powders at 500 ºC. The average crystallite size decreased with increase in the Zn content. A DC electrical resistivity of the Ni-Zn ferrite, however, decreased with increase in the Zn content, its value was much higher than those samples prepared by the conventional ceramic route by using ZnO instead of Zn. This is attributed to smaller grains size which were obtained by using Zn. The FT-IR results suggested two absorption bands for octahedral and tetrahedral sites in the range of 350-700 cm^{-1}. The VSM results revealed that by increasing the Zn content from 0.36 to 0.5, a saturation magnetization reached its maximum value; afterwards, a decrease was observed for Zn with x = 0.64. Finally, magnetic permeability and dielectric permittivity were studied by