

Influence of Vanadium Pentoxide Addition on the Structural and Electromagnetic Properties of Li-Zn Ferrites

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Abstract

The influence of V_2O_5 addition on the microstructural, electrical and magnetic properties of Li-Zn ferrites having the compositions $Li_{0.25}Zn_{0.50}Fe_{2.25}O_4 + xV_2O_5$ (where $x = 0.0, 0.4, 0.8$ and 1.2 wt %) are reported in this study. The X-ray diffraction patterns confirmed that the crystal structures of all the prepared samples were the cubic spinel phase. Microstructural studies showed that the average grain sizes were increased from 5.3 (for $x = 0.0$ wt%) to $7.7\mu m$ (for $x = 0.8$ wt% V_2O_5), which could be attributed to the role of V_2O_5 as sintering aid to enhance the densification of the samples. The magnetic hysteresis analysis demonstrated that the saturation magnetizations were increased from 44.0 (for $x = 0.0$ wt%) to 50.3 emu/g (for $x = 0.8$ wt% V_2O_5). However, the saturation magnetization was found to decrease for $x = 1.2$ wt% V_2O_5 , which may be related to weaken of exchange interaction due to the introduction of excess non-magnetic V_2O_5 . The complex initial magnetic permeability has been studied and it shows that the enhancement of the permeability is clearly evidenced on V_2O_5 addition. The complex impedance spectroscopy through Cole-Cole plot has demonstrated a partial semicircular arc, which indicates that conduction mechanism takes place predominantly through the grain property.