Structural and Vibrational Studies of Ni Alx Fe2-x O4 Ferrites

Authors : Kamel Taıbı, Abdelmadjid Rais

Abstract : Nickel-Aluminium ferrites with the general formula Ni Alx Fe2-x O4 ($0 \le x \le 1$) were studied using X-ray diffraction, Infra Red and Raman spectroscopy. XRD diffraction patterns and their Reitveld refinements show that all samples have a pure single-phase cubic spinel structure. From these patterns, the lattice parameters of these samples have been calculated and compared with those predicted theoretically. Most of the values were found to decrease with increasing Al content. Infra Red spectra showed two significant absorption bands. The high band corresponds to tetrahedral (A) sites and the lower band to octahedral [B] sites, thus confirming the single phase spinel structure. For all compositions, Raman spectra show the five active modes A1g + E1g + 3 T2g of the motion of O2- ions and both the A-site and B-site ions. The Raman frequencies trend with aluminium concentration show a blue shift for all modes consistent with the replacement of Fe3+ by lower mass Al3+. Composition dependence of the Raman frequency modes is discussed in relationship with the cations distribution among the A-sites and B-sites.

Keywords : Ni-Al ferrites, spinel structure, XRD, Raman spectroscopy

Conference Title : ICMMSE 2014 : International Conference on Mechanics, Materials Science and Engineering

Conference Location : Istanbul, Türkiye

Conference Dates : December 22-23, 2014