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Structural and Elastic Properties of Chromium Substituted Nickel Ferrites

V. T. Muttannavar[1], Pradeep Chavan[2], Geeta Chavan[3], P. B. Belavi[4] and L. R. Naik[2]
[1]Department of Physics, J. S. S. College, Dharwad, Karnataka, India – 580 003
[2]Department of Physics, Karnatak University, Dharwad, Karnataka, India – 580 003
[3]Department of Physics, Karnataka Science College, Dharwad, Karnataka, India – 580 003
[2]Department of Physics, Gogte Institute of Technology, Belgaum, Karnataka, India – 590 008

Email: naik_40@rediffmail.com

Abstract

Polycrystalline ferrites with general formula $Cr_xNi_{1-x}Fe_2O_4$, (in which x = 0.0 to 0.4) were synthesized by conventional solid state reaction method. The structural parameters such as crystallite size, lattice constant, miller indices, interplanar distance and porosity were estimated using X-ray diffraction measurement. The existence of single phase cubic spinel structure of ferrites without impurities was confirmed by XRD measurement. The crystallite size increases with increase in bismuth concentration (ranging from 283nm to 528nm). The lattice constant increases with increase of bismuth content. IR absorption bands observed at 410cm^{-1} and 590cm^{-1} confirm the existence of octahedral and tetrahedral complexes. The elastic parameters of Bismuth substituted Ni-Cu ferrites such as longitudinal elastic wave velocity, transverse elastic wave velocity, modulus of rigidity, young's modulus, and bulk modulus and Debye temperature were estimated by using FTIR study. Debye temperature was found to decrease from 463^{0}C to 425^{0}C as the concentration of bismuth increases. The oxygen positional parameter (σ) obtained at around 0.35 was due to the strengthening of inter atomic bonding between various atoms continuously.

Keywords: Sintering, XRD, FTIR, Elastic parameters, Debye temperature.

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