

Spectroscopy Investigation of Ni_{0.5}Zn_{0.5}Fe₂O₄ Nano Ferrite Prepared by Soft Mechanochemical Synthesis

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Abstract : Nickel-zinc ferrite, Ni_{0.5}Zn_{0.5}Fe₂O₄ was prepared by mechanochemical route in a planetary ball mill starting from mixture of the appropriate quantities of the Ni(OH)₂, Zn(OH)₂ and Fe(OH)₃ hydroxide powders. In order to monitor the progress of chemical reaction and confirm phase formation, powder samples obtained after 5 h and 10 h of milling were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM), IR, Raman and Mössbauer spectroscopy. It is shown that the soft mechanochemical method, i.e. mechanochemical activation of hydroxides, produces high quality single phase Ni_{0.5}Zn_{0.5}Fe₂O₄ samples in much more efficient way. From the IR spectroscopy of single phase samples it is obvious that energy of modes depends on the ratio of cations. It is obvious that all samples have more than 5 Raman active modes predicted by group theory in the normal spinel structure. Deconvolution of measured spectra allows one to conclude that all complex bands in the spectra are made of individual peaks with the intensities that vary from spectrum to spectrum. The deconvolution of Raman spectra allows to separate contributions of different cations to a particular type of vibration and to estimate the degree of inversion.

Keywords : ferrite, X-ray diffraction, infrared spectroscopy, Raman spectroscopy, Mössbauer spectroscopy

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