Structural and paramagnetic behavior of spinel NiCr2O4 nanoparticles synthesized by thermal treatment method: effect of calcination temperature

ABSTRACT

Spinel nickel chromite nanoparticles were synthesized using a simple thermal treatment method. The effect of calcination temperatures on the final properties of obtained materials was carefully examined using various characterization techniques.The infrared spectra of nickel chromite (NiCr2O4) revealed the characteristic bonds of metalï oxygen for Nisingle bondO and Crsingle bondO bands around 600 and 470 cmī 1, respectively. The powder X-ray diffraction patterns exhibited the formation of normal spinel phase of NiCr2O4 in the calcination process at temperature between 550 and 850 °C. From transmission electron micrographs, nanosized particles with average size of ~7ï 64 nm were observed at calcination temperatures of 550ï 850 °C, respectively. The calcined samples at 750 and 850 °C exhibited paramagnetic behavior with g-factor values of 1.92 and 2.15, peak-to-peak line width of 25.59 and 117.02 Oe and resonance magnetic field of 342.04 and 306.49 Oe, respectively. Variation in the value of g-factor, peak-to-peak line width and resonance magnetic field can be attributed to the dipoleï dipole and super exchange interactions.

Keyword: A. Nanostructures; C. Electron microscopy; C. Infrared spectroscopy; C. X-ray diffraction