Solid State Science and Technology, Vol. 21, No 1 & 2 (2013) 47-54
ISSN 0128-7389

THERMAL TREATMENT SYNTHESIS AND CHARACTERIZATION OF NANOSIZED NICKEL CHROMITE SPINELS.

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ABSTRACT

The simple preparation of fine-particle nickel chromite ($NiCr_2O_4$) nanoparticles have been prepared from an aqueous solution containing nickel (II) nitrate, chromium (III) nitrate, polyvinyl pyrrolidone (PVP) as a capping agent and deionized water as a solvent. The mixtures were thermally treated at various temperatures from 450°C to 600°C which the stability of the particles was achieved when the calcination occurred. The synthesized powders were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), transmission electron microscopy (TEM) and electron spin resonance (ESR). The crystallization of $NiCr_2O_4$ was completed at 600°C, as publicized by the absence of organic absorption band in FT-IR spectra. XRD results for the calcined samples of the $NiCr_2O_4$ nanoparticles at different temperatures show the reflection planes of (220), (311), (400), (511) and (440). The main peak was centered at 2θ = 35.86° and corresponds to a crystal plane with Miller indices of (311), which confirm the presence of single-phase $NiCr_2O_4$ with a face-centered cubic (FCC) spinel $NiCr_2O_4$. The magnetic property of $NiCr_2O_4$ was characterized by ESR where the values of linewidth, ΔH_{pp} and g-factor were increase while the values of magnetic resonance field, Hr, were decreased as calcination temperature increased. The morphology of nanoparticles study by TEM revealed that the size of nickel chromite was estimated in the range around 6 nm to 17 nm.

Keywords: nickel chromite; thermal treatment;

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