Sessions: Nanotechnology
Preferred presentation Type: Poster

Transition and Phase Stabilization in (hcp-fcc) CoO - Nanoparticles by Thermal Decomposition Method

R.V. Santos; A. C. Campos; S. V. Santos; C. Sena. G. A. Cabrera-Pasca;
Universidade Federal do Pará, Campus de Abaetetuba, rua Manoel de Abreu s/n, 68440-000 Abaetetuba, PA

Abstract:

Phase transitions and structural control is a scientific challenge of macroscopic materials, this challenge is even greater for the nanometer scale. Specifically, in nanoparticles (NPs) the surface/volume ratio and temperature has influence on physical and chemical properties very important to novel applications [1]. Therefore, nanoscale structures has enormous potential for applications in the field of nanotechnology with emphasis on biosensors, pharmaceuticals and catalysts [2-3]. In the present work were synthesized monodisperse nanoparticles (NPs) CoO of cubic (fcc) type, hexagonal (hcp) and mixed (fcc/hcp) by thermal decomposition. This method allows obtaining NPs with a high degree of uniformity that will find different applications in large range of research fields [4-6]. For synthesis via thermal decomposition, a suitable concentration of oleylamine ($C_{18}H_{37}N$) , oleic acid ($C_{18}H_{34}O_2$) and 0.4 g Co $(acac)_3$ were used and subjected to strict control of temperature (220° C) at different reaction times (1h, 3h and 5h) under an inert atmosphere of nitrogen/Argon. On the other hand, it was necessary to change temperature and oleic acid and oleylamine concentration in order to synthesize nanoparticles with mixed phase (fcc / hcp structure). The morphological and structural properties were analyzed using x-ray Diffraction (XRD), X-ray Spectroscopy for Energy Dispersion (EDX) and Scanning Electron Microscopy (SEM). From the analysis of XRD were studies the crystal structure of our NPs, these results revealed that the oleic acid concentration and temperature are essential to structural transition phase like hcp to fcc in CoO Nps this fact show of the CoO-hcp NPS instability. In addition, we were analyses the crystal size using the Debye-Scherrer equation that revealed a sizes around 32.64 nm. SEM images showed spherical morphology and EDX allows to discard the presence of contaminants in all our CoO Nps.

References:

[1] M. S. Akhtar, J. Panwar, and Y. S. Yun, American Chemical Society 1, 591- 602 (2013).

[2] Zeng, H.; Li, J.; Liu, J. P.; Wang, Z. L.; Sun, S. H. ExchangeCoupled Nanocomposite Magnets by Nanoparticle Self-Assembly. Nature 2002, 420, 395−398.

[3] Willard, M. A.; Kurihara, L. K.; Carpenter, E. E.; Calvin, S.; Harris, V. G. Chemically Prepared Magnetic Nanoparticles. Int. Mater. Rev. 2004, 49, 125−170.

[4] Tolbert, SH; Alivisatos, AP Science 1994 , 265 , 373.

[5] Tolbert, SH; Alivisatos, AP J. Chem. Phys. 1995 , 102 , 4642.

[6] Chen, CC; Herhold, AB; Johnson, CS; Alivisatos, AP Science 1997 , 276 , 398.