



## Effect of calcination temperature on the physical properties of $Zn_{0.5}Co_{0.5}Pr_xFe_{2-x}O_4$ nanoparticles synthesized by co-precipitation method

Zouheir Bitar

Department of physics, faculty of science, Beirut Arab University, Beirut, Lebanon

### Abstract:

The effect of calcination temperature, varying from 773 to 923 K, on the synthesis of  $Zn_{0.5}Co_{0.5}Pr_xFe_{2-x}O_4$  ( $0 \leq x \leq 0.2$ ) by co-precipitation method was discussed in our present work. The X-ray powder diffraction XRD patterns for all the samples confirmed the formation of zinc cobalt nano ferrite with fcc spinel phase and  $Fd\bar{3}m$  space group. The crystallite size calculated from XRD and the particle size measured from the Transmission Electron Microscope TEM increased with the increase of calcination temperature for all samples with different concentrations of  $Pr^{3+}$ . The variation of calcination temperature didn't show any change in the shape of the prepared nanoparticles. The impurity of all samples was investigated by the Fourier Transform Infrared FTIR spectra. UV-vis absorption spectra showed a red-shift with increasing the calcination temperature. The band gap energy  $E_g$ , determined from Tauc-plot, decreased with the increase of calcination temperature. This result is in good agreement with the decrease of particle size.  $\Delta H_{pp}$  and  $g$ -value, obtained from the Electron Paramagnetic Resonance EPR spectra, increased with the rise of calcination temperature from 773 to 923 K. The variation of  $g$ -value can be an indicator for the rearrangement of cations between tetrahedral and octahedral sites due to the variation of calcination temperature.

### Biography:

Zouheir Bitar is a researcher in the physics department of Beirut Arab University, Lebanon. Currently, he is working on researches related to nanomaterials in the materials laboratory of Beirut Arab University. He received the Ph.D. in 2018 from Beirut Arab University. He has seven articles published in international journals. Recently, he is working on a new project. He believes in teamwork.



### Publication of speakers:

- Qu, Y., Yang, H., Yang, N., Fan, Y., Zhu, H., & Zou, G. (2006). The effect of reaction temperature on the particle size, structure and magnetic properties of coprecipitated  $CoFe_2O_4$  nanoparticles. *Materials Letters*, 60:3548–3552.
- Hemeda, O. (2004). IR spectral studies of  $Co_{0.6}Zn_{0.4}Mn_xFe_{2-x}O_4$  ferrites. *Journal of Magnetism and Magnetic Materials*, 28:36-41

[International Webinar on Materials Research & Technology; November 15, 2020; Osaka, Japan](#)

**Citation:** Zouheir Bitar, Effect of calcination temperature on the physical properties of  $Zn_{0.5}Co_{0.5}Pr_xFe_{2-x}O_4$  nanoparticles synthesized by co-precipitation method; *Materials Research & Technology*; November 15, 2020; Osaka, Japan.