



## **Synthesis and Characterization of $\text{Co}_3\text{O}_4$ - $\text{CuO}$ - $\text{ZrO}_2$ Ternary Nanoparticles**

**S. Alwin David and C. Vedhi\***

**Department of Chemistry, V.O Chidambaram College, Tuticorin 628008,  
Tamilnadu, India**

**Abstract :** Nano  $\text{Co}_3\text{O}_4$  -  $\text{CuO}$  -  $\text{ZrO}_2$  mixed oxides were synthesized by wet chemical method by mixing of equimolar solutions of cobalt chloride, copper sulphate and zirconium oxychloride in aqueous sodium hydroxide and refluxed at elevated temperature. The prepared mixed nano oxides were characterized by FT-IR, XRD, UV-DRS, TEM, SAED, SEM, EDAX and AFM. The FTIR spectra exposed the presence of M-O bonds (M = Co, Cu, Zr). From XRD studies, the size of the  $\text{Co}_3\text{O}_4$  -  $\text{CuO}$  -  $\text{ZrO}_2$  NPs are found to be 12.93 - 23.83nm through Scherrer's formula. The XRD patterns also reveal that the nanoparticle size is drastically increased with increasing concentration of the precursors. From UV-Vis diffuse reflectance spectra (DRS), band gap energy of the (0.1 – 0.5M)  $\text{Co}_3\text{O}_4$  -  $\text{CuO}$  -  $\text{ZrO}_2$  NPs are found to be in the range of 3.13 - 3.24eV. The TEM, SEM and AFM micrographs of 0.1M  $\text{Co}_3\text{O}_4$  -  $\text{CuO}$  -  $\text{ZrO}_2$  NPs display irregular shape with size ranging from 10 - 40nm. SAED pattern confirms the crystalline nature of these nanoparticles. EDAX analysis indicates the presence of Co, Cu, Zr and O.

**Keywords:**  $\text{Co}_3\text{O}_4$  -  $\text{CuO}$  -  $\text{ZrO}_2$  NPs, Mixed nano oxides, Wet chemical method, Band gap energy.

**C. Vedhi *et al*** /International Journal of ChemTech Research, 2017,10(7): 905-912.

\*\*\*\*\*