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Elaboration of Metallic oxide nanopowder Fe doped ZnO

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Abstract : Among the methods of elaboration the metallic oxide nanopowders based on green chemistry, co-precipitation is a simple process used for industrial production in different sectors. It is the preparation of an aqueous solution containing the desired cation then mixing with a solution containing the precipitating agent. The precipitate is then separated from the liquid by filtration, washing, drying and then thermally decomposing to yield the desired product. Our study focused on pure and Fe doped ZnO nanopowders ($Zn_{1-x}Fe_xO$, $x=0.0, 0.005, 0.02, 0.05$ and 0.15) prepared by coprecipitation method at room temperature with zinc acetate as a zinc source. Samples were analyzed by X-ray diffraction (XRD), scanning electron microscope (SEM), infrared spectroscopy (IR) and UV-visible spectroscopy. All powders are polycrystalline with a hexagonal (wurtzite) structure, grain sizes were nanometric. From a doping level a secondary phase $ZnFe_2O_4$ appears and found a decrease in grain size and increase in internal stresses with increasing the concentration of Fe dopant. SEM images show the existence of agglomerated powder particles in spherical form. IR infrared spectroscopy we identified the specific vibration and the peak characteristic of the ZnO matrix, Zn-O binding was clearly observed at around 470 cm^{-1} . The study of the optical properties of the samples clearly shows the doping effect on the optical absorption spectra and allowed us to determine the optical absorption edge and the width of the gap.

Keywords : ZnO, $ZnFe_2O_4$, co-precipitation, the structural properties, nanopowder.