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Structural and optical studies of cobalt and indium simultaneously doped zinc oxide nanopowders prepared using high energy ball milling technique

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Samples of undoped ZnO, Co and In single doped and Co-In co-doped ZnO nanoparticles were prepared using the high energy ball milling method. X-ray diffraction (XRD), ultraviolet-visible spectroscopy (UV-Vis) and photoluminescence (PL) spectroscopy were employed to characterise the prepared samples. The peaks obtained from the XRD patterns indicated that the samples prepared were of hexagonal ZnO nanoparticles. Additional peaks were reflected within the doped samples belonging to Co²⁺ and In³⁺ ions. These peaks indicated that Co²⁺ and In³⁺ ions preferred the interstitial site in the hexagonal ZnO structure. The lattice parameters were not significantly affected by the dopant concentration of either Co or In. The average grain sizes of the nanoparticles were found to be reduced when In and Co were incorporated into the ZnO nanoparticles structure. The band gap energies were calculated using the UV-Vis. It was found that the doped ZnO nanoparticles had smaller band gap energy compared to the undoped ZnO nanoparticles. In the PL studies, excitation wavelength of 350 nm was used and various defects related emissions were observed for the doped and undoped ZnO nanoparticles.

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MSc

Main supervisor (name and email) and his / her institution

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