ABSTRACT

Pristine ZnO, Cu^{2+}:ZnO, Ce^{3+}:ZnO and Cu^{2+}, Ce^{3+}:ZnO nanopowders with different doping concentrations (0, 0.31, 0.62, 0.93 and 1.24% of dopant) were synthesized by sol–gel technique with low sintering temperature of 600 °C. The powders were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), selected-area electron diffraction (SAED), UV–Vis optical absorption and photoluminescence (PL) spectroscopy analysis. XRD patterns revealed that all the compounds are hexagonal wurtzite crystalline structure and that all the dopant atoms substituted Zn atoms in the ZnO lattice and there was no formation of extra Phases. SEM photographs displayed morphology of the prepared nanopowders. The UV–Vis absorption spectrum presented an absorption peak at 355 nm which was ascribed to ZnO nanoparticles. The photoluminescence spectrum displayed emission peaks at 486 nm and 527 nm. The 486 nm peak conformed to bandgap excitonic emission and the 527 nm peak was attributed to the existence of independently ionized oxygen vacancies. Sol–gel technique has capability for application in manufacturing units, because its process is simple and the reagents used are economical. Particle sizes in the range 10–51 nm were realized from the TEM analysis.