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Synthesis of zinc oxide based nanophosphors by solution-combustion method

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Abstract content
   (Max 300 words)

Zinc oxide (ZnO) is a wide direct band gap semiconductor (3.37 eV) with a large exciton binding energy (60 meV), and it is a promising future material for applications in the field of light emitting materilas1,2. The photoluminescence (PL) spectra show UV near band edge emission around 380 nm and defect related deep level emission (DLE), which depends upon the synthesis methods and growth conditions. The visible emission in ZnO is observed due to presence of DLE bands3,4. It is important to understand the origin of these emissions for the development of highly efficient optoelectronic devices. In this paper, ZnO nano-phosphors (NPr) were synthesized by a solution-combustion method using zinc nitrate and zinc acetate as precursors and urea as a fuel. Terbium nitrate pentahydrate and europium nitrate pentahydrate were used as a dopant source for terbium (Tb) and europium (Eu) to enhance the luminescence property of ZnO based NPr. Hexagonal wurtzite structures of ZnO were confirmed by the X-rays diffraction spectra. A broad band orange-red emission from 500 to 850 nm was obtained from the ZnO NPr prepared with the nitrate precursor which may be attributed to oxygen related defects. Terbium doped ZnO (ZnO:Tb) NPr has shown green emission, while europium doped ZnO (ZnO:Eu) NPr enhanced the red emission in ZnO NPr at lower doping concentrations. The intensity of the luminescence (DLE) decreased at higher concentration of Tb and Eu, due to the formation of Tb4+ and Eu4+.

Keywords: DLE, XPS, ZnO, NPr and Red emission

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