Synthesis and luminescence properties of Pr doped SLS–ZnO glass composite material for red phosphors

ABSTRACT

Praseodymium (Pr) doped SLS–ZnO glass composite material of chemical formula $[(SLS)_{0.5}(ZnO)_{0.5}(Pr)_x]$ where x = 1 wt% sintered at 600, 700, 800, 900 and 1000 °C were prepared by solid state technique. The structure, morphology and luminescence properties have been characterized by X-ray diffraction (XRD), Fourier transform infrared radiation (FTIR), UV–Vis spectroscopy, photoluminescence spectroscopy (PL), field emission scanning microscopy (FESEM) and energy dispersive X-ray (EDX). The XRD, FTIR and EDX studies reveal the formation of Zn_2SiO_4 from SLS–ZnO host lattice. FESEM shown the particle size distribution would lead to a higher packing density by increasing sintering temperatures. The presence of Pr^{3+} ions into Zn_2SiO_4 was confirmed by EDX analysis. The absorption peaks at 360, 444 and 616 nm originate in the UV and visible range were observed by UV–Vis spectroscopy. The PL spectrums with excitation at 444 nm exhibit two strong red emission peaks at ~613 and ~637 nm were attributed to the transition of $^3P_o \rightarrow {}^3H_6$ and $^3P_o \rightarrow {}^3F_2$. It is found that Pr^{3+} ions substituted into the host lattice could improve to the luminescence properties with increasing sintering temperatures. These results indicate that Pr doped SLS–ZnO exhibits great potential red phosphors in WLEDs application.

Keyword: Synthesis; Luminescence properties; Praseodymium (Pr); SLS–ZnO glass composite material; Red phosphors

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