

Defect induced PL enhancement in Dy³⁺ doped ZrO₂

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Abstract

ZrO₂: (1mol%)Dy³⁺:xNa⁺ (x=0.0, 0.01, 0.03, 0.05, 0.07, 0.09) phosphors were prepared by one step solution combustion method. X-ray diffraction, reveals crystallization of the samples in cubic phase. Influence of alkali metal ion (Na⁺) on surface morphology were realized from SEM micrograph. PL spectra exhibited two strong emission peaks at 480nm and 580nm which corresponds to characteristic transitions of Dy³⁺ ions in the samples, while excited at 350nm. However, the intensity of peaks varies considerably with the variation of the co-dopant/compensator (Na⁺) concentration, representing the variation of the crystal field. Effects of charge compensator and their concentration on the structural and luminescence properties of ZrO₂: (0.01)Dy³⁺:xNa⁺ phosphors were thoroughly investigated. Luminescence intensity, emission colour and phase of ZrO₂:(0.01)Dy³⁺ phosphors were improved remarkably with the addition of charge compensator (Na⁺), which would promote their applications in white light-emitting diodes with near- ultraviolet chip.

Key words: Combustion synthesis; Luminescence; PL enhancement; effect of charge compensator