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Combustion synthesis of Dy³⁺-doped YVO₄ phosphor

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Abstract :

Yttrium orthovanadate (YVO₄) belongs to the space group 19D4h [1] and is an important optical material that has been given considerable attention due to its outstanding characteristics, such as excellent thermal, mechanical and optical properties. There are two basic approaches to generate white light from light emitting diodes (LEDs). One is by mixing light of different colours emitted by several chips called multichip LEDs and the other is to convert the light emitted from a blue or ultraviolet (UV) LED to a longer wavelength light using phosphors, which are called phosphor-converted (pc) - LEDs. In order to produce a phosphor that will produce white light for the LED applications Dy³⁺ -doped YVO₄ phosphors were produced by a combustion method at 600°C. The structure and optical properties of the powders were investigated using X-ray diffraction (XRD), scanning electron microscopy, Fourier transform infrared spectroscopy and photoluminescence (PL). The XRD patterns showed the tetragonal phase which agreed very well with the standard JCPD file (17-0341). In the PL, the emission spectra exhibited a weak band at 663 nm for 4F_{9/2}-6H_{11/2} and a peak at 283 nm for 4F_{9/2}-6H_{13/2} and the 257 nm peak with a higher intensity for the 4F_{9/2}-6H_{15/2} transition. The emission colour of the luminescence is close to white because of the yellow (4F_{9/2} → 6H_{13/2}) and blue (4F_{9/2} → 6H_{15/2}) emissions of Dy³⁺ and has the potential to be used as a phosphor for pc-LEDs.

Award :

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Yes

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