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The effect of urea ratio on structural and luminescence properties of YVO₄:Dy phosphor

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The effect of urea ratio on structural and luminescence properties of YVO₄:Dy phosphor

1. Introduction

Although the luminescence characteristics of vanadates phosphors have been reported, yttrium vanadates (YVO₄) are good host materials for luminescence efficiency. Like Eu, Tm and other rare earth ions, Dy can also act as a useful activator. Many researchers have reported that YVO₄ can be modified by Eu to be used as red phosphor in colour television and cathode because of its high luminescence [1]. Besides europium, Dy ions is a good activator for YVO₄: Dy³⁺. Synthesis of YVO₄ has previously been prepared by various methods. Here YVO₄:Dy was prepared by combustion method at initiation temperature of 600 °C. Combustion method is one of an ideal technique, because exothermic reaction was initiated at the ignition temperature and it generates heat which was manifested in a maximum temperature of 100-1650 K.

1. Results

Figure 1 shows the XRD patterns of the YVO₄:Dy powders synthesized by combustion method at initiation temperature of 600 °C with different mole ratios of urea. The phosphor powder showed that the peaks were due to YVO₄ tetragonal phase (JCPDS 17-0341). No other crystalline phase was detected on XRD spectra. Scanning electron microscopy results showed when increasing ratio of urea the agglomeration of particles decreases and the nanorod-like shape structure starts to form. Figure 2 shows the emission spectra obtained from excitation of 282 nm. The emission spectra consist of two main peaks, yellow band at 573 nm corresponding to 4F_{9/2}→6H_{13/2} and the blue band (482 nm) corresponds to the 4F_{9/2}→6H_{15/2} transition. There is a very weak band at 663 nm which correspond to 4F_{9/2}→6H_{11/2} transition. The intensity of the yellow emission is stronger than that of blue emission, this is because when the Dy³⁺ ions is located at low symmetry local sites with no inversion centers, the 4F_{9/2}→6H_{13/2} transition is prominent in its emission spectrum.

1. References

- [1] J. Wang, Y. Xu, M. Hojamberdiev, Y. Cui, H. Liu and G. Zhu, J. of Alloys and Compounds. 479 (2009), 772-776.
[2] H. Zhang, X. Fu, S. Niu and Q. Xin, J. of Alloys and Compounds. 457 (2008) 61-65.

Are you currently a postgraduate student? (Yes/No)

yes

At what level of studies are you currently? (Hons/MSc/PhD)

PhD

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