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

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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 oC. 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 o 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 4F9/2⟶6H13/2 and the blue band (482 nm) corresponds to the 4F9/2⟶6H15/2 transition. There is a very week band at 663 nm which correspond to 4F9/2⟶6H11/2 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 4F9/2⟶6H13/2 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

Please provide the name and email address of your supervisor.

Prof.B.F. Dejene dejenebf@qwa.ufs.ac.za

Primary author: Mrs FOKA, Kewele Emily (University of the Fee Stae)

Presenter: Mrs FOKA, Kewele Emily (University of the Fee Stae)

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