World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:03, 2015

Comparison of Methods for the Synthesis of Eu+++, Tb+++, and Tm+++ Doped Y2O3 Nanophosphors by Sol-Gel and Hydrothermal Methods for Bioconjugation

Authors : Ravindra P. Singh, Drupad Ram, Dinesh K. Gupta

Abstract : Rare earth ions doped metal oxides are a class of luminescent materials which have been proved to be excellent for applications in field emission displays and cathode ray tubes, plasma display panels. Under UV irradiation Eu+++ doped Y2O3 is a red phosphor and Tb+++ doped Y 2O3 is a green phosphor. It is possible that, due to their high quantum efficiency, they might serve as improved luminescent markers for identification of biomolecules, as already reported for CdSe and CdSe/ZnS nanocrystals. However, for any biological applications these particle powders must be suspended in water while retaining their phosphorescence. We hereby report synthesis and characterization of Eu+++ and Tb+++ doped yttrium oxide nanoparticles by sol-gel and hydrothermal processes. Eu+++ and Tb+++ doped Y2O3 nanoparticles have been synthesized by hydrothermal process using yttrium oxo isopropoxide [Y5O(OPri)13] (crystallized twice) and it's acetyl acetone modified product [Y(O)(acac)] as precursors. Generally the sol-gel derived metal oxides are required to be annealed to the temperature ranging from 400°C-800°C in order to develop crystalline phases. However, this annealing also results in the development of aggregates which are undesirable for bio-conjugation experiments. In the hydrothermal process, we have achieved crystallinity of the nanoparticles at 300°C and the development of crystalline phases has been found to be proportional to the time of heating of the reactor. The average particle sizes as calculated from XRD were found to be 28 nm, 32 nm, and 34 nm by hydrothermal process. The particles were successfully suspended in chloroform in the presence of trioctyl phosphene oxide and TEM investigations showed the presence of single particles along with agglomerates.

Keywords : nanophosphors, Y2O3:Eu+3, Y2O3:Tb+3, sol-gel, hydrothermal method, TEM, XRD
Conference Title : ICNMN 2015 : International Conference on Nanostructured Materials and Nanotechnology
Conference Location : Miami, United States
Conference Dates : March 09-10, 2015

Open Science Index, Materials and Metallurgical Engineering Vol:9, No:03, 2015 publications.waset.org/abstracts/14766.pdf