# Effect of Zn addition on optical properties and microstructure of $Y_2O_3$:Eu nanopowders by solution combustion method


*Esmail Tohidlou[1], Yadolah Ganjkhanlou[2], Mahmood Kazemzad[2], Mehdi Shafii[1]*
*1-University of Sistan and Baluchestan, P.O.BOX: 9816745563-161, Zahedan, Iran*
2-Materials and Energy Research Center, *P.O. BOX: 31787- 316, Tehran, Iran*
*etohidloo@yahoo.com, yadolah1@gmail.com, kazemzad@gmail.com, shafieeafarani@gmail.com*


Eu doped $Y_2O_3$ phosphors have been studied as potential red phosphors for applications in field emission displays, cathode ray tube phosphors, three color lumps and etc [1]. The chemical and thermal stability of $Y_2O_3$:Eu are higher than sulfide based phosphors such as $Y_2O_2SO_4$:Eu [2-4]. It has also higher quantum efficiency and stability against high current densities, but unfavorable chromaticity and conductivity of this compound decrease the cathodoluminescence intensity and result in limited application for this compound [3]. These limitations can be overcome by addition of zinc to the $Y_2O_3$:Eu phosphor. Zinc is usually added to the surface of phosphors (dead layer) in order to increase their conductivity and cathodoluminescence intensity [2]. But results of this study showed that doping Zn at the structure improves the chromaticity and photoluminescence intensity [2, 3].

In this work, three samples with chemical composition of $Y_2O_3$:Eu(3%) [Sample A], $Y_2O_3$:Eu(3%),Zn(2.5%) [Sample B], $Y_2O_3$:Eu(3%),Zn(2.5%) (Zn was added only at surface) [Sample C] were synthesized by multistep urea solution combustion method.

Investigation of these samples by XRD (Fig. 1) and photoluminescence analysis methods (Fig. 2) showed that, addition of zinc at the structure of phosphors instead of surface, enhances the photoluminescence intensity as well as red color chromaticity (Fig. 3) . Moreover, SEM images (Fig. 4) and micro-structural and crystallographic parameters, determined by Rietveld refinement method, revealed that sample C has lower crystallinity. This confirms that doping of Zn in Structure of $Y_2O_3$:Eu (Sample B) is more effective than addition of Zn only at the surface. It is originated from grain growth inhibition caused by zinc oxide accumulated on the surface (sample C).

**References:**


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**Figures:**

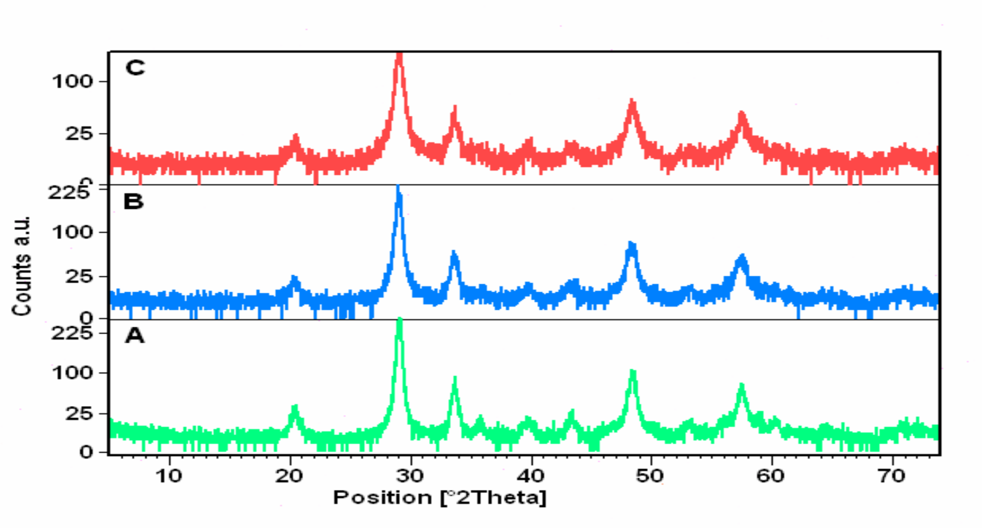



Fig.1 XRD of all samples

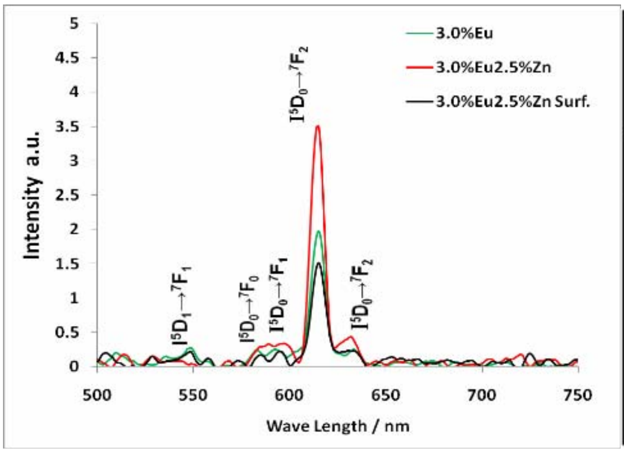



Fig.2 photoluminescence spectra of all samples

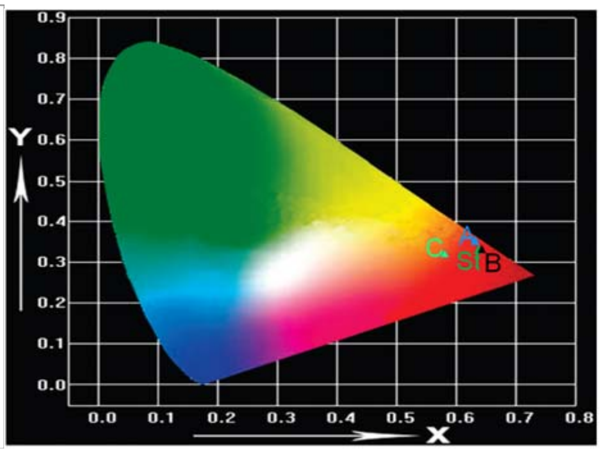
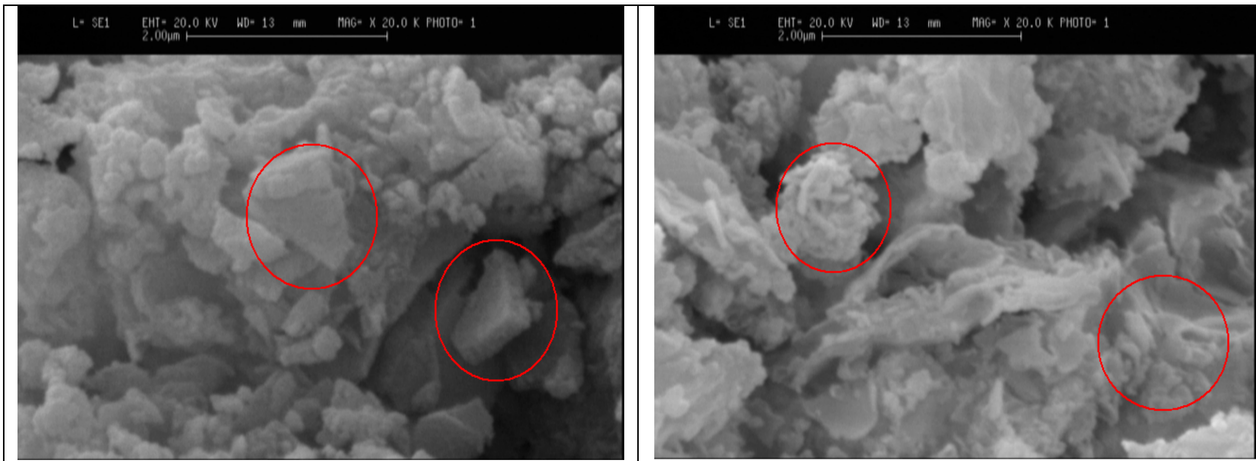



Fig.3 Chromaticity of various sample



| B | C |
|---|---|

Fig.4 SEM image of sample B and C