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Synthesis and Thermoluminescence Studies of Eu Doped $Ca_3Si_3O_8F_2$ Phosphor

Y.S.Patil^, K. G. Chaudhari^, A.P. Zambare[1] and K.V.R.Murthy[*]
^Applied Physics Department, MCT'S Rajiv Gandhi Institute of Technology,
Versova , Andheri (w), Mumbai-400053
1Department of Physics, Agasti Arts, Commerce & D.R. Science College, Akole
Tal- Akole, Dist- Ahmednagar, Pin – 422 601.(M.S.)
* Applied Physics Department, Faculty of Tech. & Engg. ,Kalabhavan, Baroda –1

Abstract

The present paper reports, Eu doped $Ca_3Si_3O_8F_2$ phosphor has been prepared at 0.5% concentration by solid state reaction with different fluxes. The compound obtained was grinded into fine powder and fired at 12000Cfor 3 hours in muffle furnace.The final product was characterized by XRD and TL. The TL glow curves recorded with beta source on irradiation with 20 Gy dose. The phosphor prepared by solid state reaction by different fluxes with different concentration shows different peaks at 130, 145, 165,180, 268, 309 and 330°C temperature..

Keywords:Thermoluminscence, solid state reaction, XRD,TLD, Phosphor

1.0 Introduction

TLD is one of the good techniques to measure absorbed dose. Many investigators are invented different TL dosimeter. But very few lamp phosphors are studied for TL dosimeter. The thermoluminescence examination of phosphors brings out number of information and throw light on the use of materials as TL dosimeter [1-5,7]. The well known phosphors developed are $LaPO_4$: Tb, Ca{Po_4}F Cl : Sb,Mn $BaMgAl_{10}O_{17}$:Eu,Nd, , $LiYF_4$:$U^{4+,}$ $BaMgAl_{10}O_{17}$:Mn, $LaPO_4$: Ce and aluminates in mono-,dia and tri-valent doped forms. In present paper, the TL spectra of synthesized phosphors have been recorded at room temperature. The spectra have been examined 0.5% concentration RE activated $Ca_3Si_3O_8F_2$ by different fuel and the characteristic spectra are presented for discussion.

1.1Experimental

The specimen of $Ca_3Si_3O_8F_2$ doped Eu have been prepared at 0.5% concentration by solid state reaction with carbon, citric acid as fuel and urea as a fuel[6]. The appropriate oxides were thoroughly grounded homogeneously in agate mortar and fired at 1200°C for three hours. The specimens thus obtained have been characterized through standard XRD technique. Samples were irradiated by β-rays usingSr-90as a natural soures for β-rays.TL glow curve are recorded at room temperature by using TLD reader 11009 supplied by Nucleonix systems Pvt.Ltd,Hyderabad.

1.1.1 Result and Discussions

The all TL glow curves are recorded at room temperature. Figure 1 represents TL glow curve of $Ca_3Si_3O_8F_2$ sample(as obtained) with 20 Gy beta irradiation. The glow curve exhibit one peak at 130°C temperature. But same phosphor doped with 0.5% Eu synthesized at reduced under carbon it exhibit one emission peak at 180°C temperatures as shown in figure 2. By using citric acid as flux on the same three peaks at 165, 203 and 330°C temperatures compared to reduce under carbon synthesized phosphor as shown in figure 3. Figure 4 represents TL glow curve of $Ca_3Si_3O_8F_2$: Eu phosphor also exhibits three peaks at 145, 268 and 309°C temperature.

Figure 5 represents TL glow curves of $Ca_3Si_3O_8F_2$: Eu with (0.5%) concentration

Series 1 represents $Ca_3Si_3O_8F_2$ as obtained phosphor.
Series 2 represents $Ca_3Si_3O_8F_2$: Eu phosphor with carbon.
Series 3 represents $Ca_3Si_3O_8F_2$:Eu phosphor with citric acid as flux.
Series 4 represents $Ca_3Si_3O_8F_2$:Eu phosphor with urea as a flux.

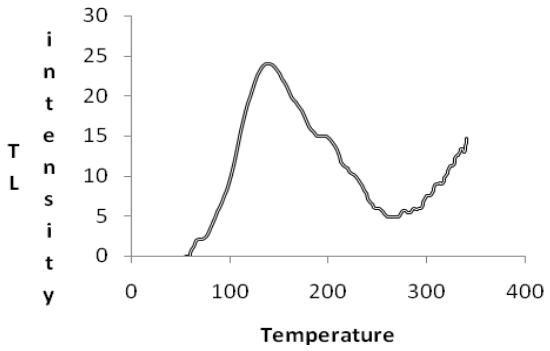

Figure 1:TL glow curve of β-irradiated as obtained $Ca_3Si_3O_8F_2$

phosphor

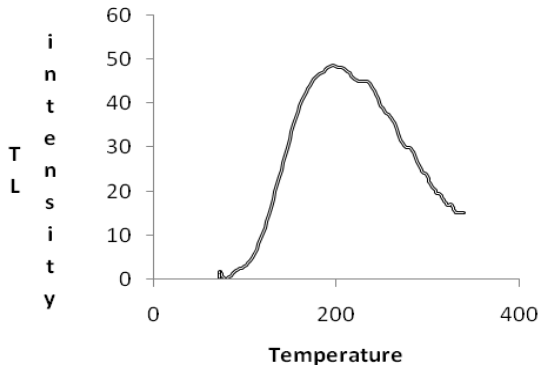

Figure 2:TL glow curve of β-irradiated $Ca_3Si_3O_8F_2$: Eu (0.5%) phosphor with carbon.

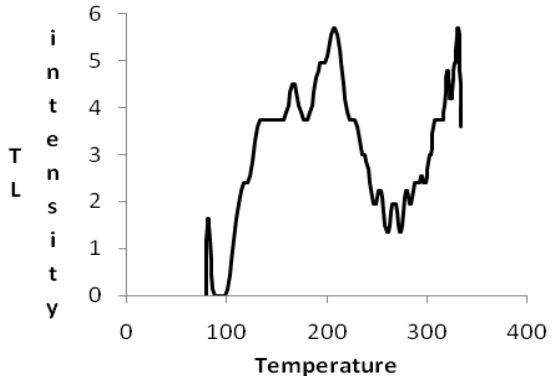

Figure 3 : TL glow curve of β-irradited $Ca_3Si_3O_8F_2$: Eu (0.5%)
phosphor by using citric acid as a flux.

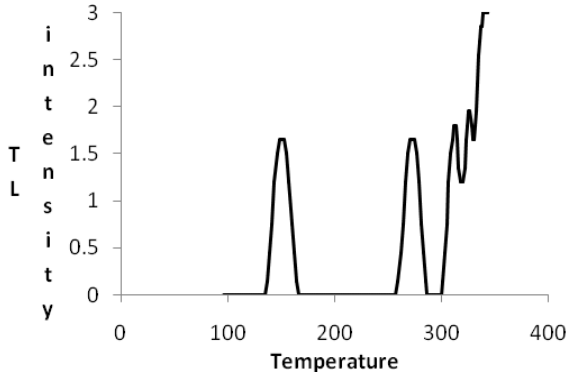

Figure 4 : TLglowcurveofβ-irradiated $Ca_3Si_3O_8F_2$: Eu (0.5%) phosphor by using urea as a flux..

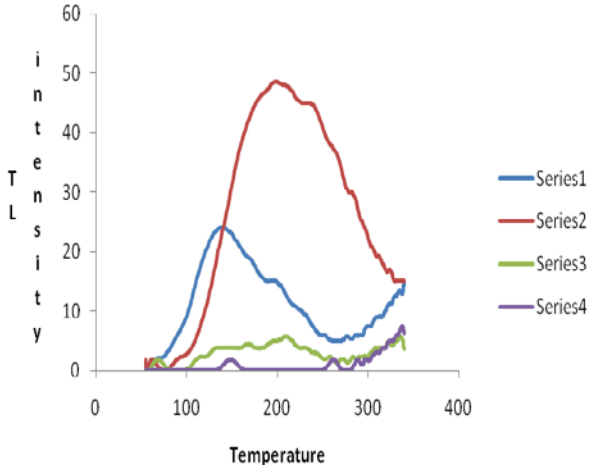

Figure 5 represents glow curves of : $Ca_3Si_3O_8F_2$ Eu with (0.5%) concentration

Series 1 : $Ca_3Si_3O_8F_2$ as obtained phosphor

Series 2 : $Ca_3Si_3O_8F_2$:Eu phosphor with carbon.

Series 3 :$Ca_3Si_3O_8F_2$:Eu phosphor with citric acid as flux.

Series 4:$Ca_3Si_3O_8F_2$:Eu phosphor with urea as a flux.

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