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## Synthesis and PL Study of SrS : Eu Phosphor

### Abstract

The present paper reports the Synthesis and Photoluminescence study of SrS Phosphor doped with Eu ions synthesized under reduced atmosphere at 9500C for one hour. Photoluminescence spectra were recorded at room temperature using Spectrofluorophotometer with the Xenon lamp as excitation source at M.S.U., Baroda. The phosphor was characterized for XRD, SEM, FTIR and particle size analysis

**Keywords:** XRD, SEM, Photoluminescence, FTIR and particle size analysis.

### INTRODUCTION

The work presented in this Paper consists of the experimental results of the SrS : Eu phosphors synthesized using Solid State Reaction. The present display phosphor requirement are for energy saving lamps of LEDs which are widely used globally. Therefore it is considered the present phosphor synthesis will help the local industry to use the indigenously developed materials. By considering the application potential, the following phosphor was prepared and studied for photoluminescence and characterized.

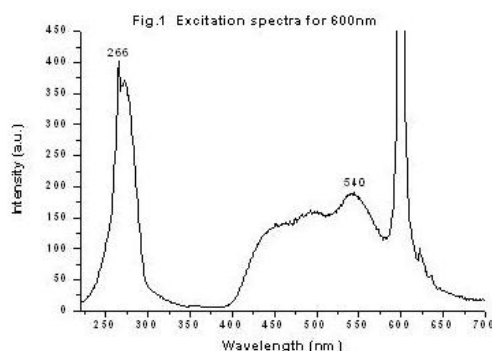
### EXPERIMENTAL

The present paper reports the Synthesis and Photoluminescence study of SrS phosphor doped with 0.05 mole% of Eu ions. Strontium Carbonate and Sulphur were taken as starting compounds in a stoichiometry of 2:3 to prepare SrS. The starting compounds along with Europium oxide as a dopant were taken in to a agate mortar and pestle. They were mixed and grounded for one hour to make a fine powder with intermediate mixings and groundings. The obtained powder was taken into a alumina crucible and heated in a muffle furnace under reduced atmosphere at 9500C for one hour. Photoluminescence spectra were recorded at room temperature using Spectrofluorophotometer having Xenon lamp as excitation source, and characterized for SEM, XRD, FTIR and particle size analysis.

### RESULTS AND DISCUSSIONS

**PL Study:** fig.1 is excitation spectra of Sr S : Eu, monitored at 600nm. The phosphor color is pale pink. It is interesting to note that there are two absorption bands from 240nm to 300nm peaking at 250nm, 280nm and another band 400nm to 580nm, peaking around 540nm. PL of this phosphor was studied for the following excitations 254nm, 264nm, 272nm, 430nm, 450nm, 464nm, 470nm, 490nm, 543nm, 570nm. So, whatever the excitation mentioned above the PL emission from Sr S:Eu phosphor are observed in the range from 520nm to 675nm with a peak at 600nm. It is interesting to note that the main PL peak at 600nm with 254 nm excitation was at 140 a.u., which increases almost 3 times for the excitation of 272nm and which was in UV absorption. In the second band excitation i.e., blue to green 430nm to 570nm the intensity at 600nm gradually increases from 120 to 165 a.u.

The PL of this phosphor for various excitations are shown in fig. 2



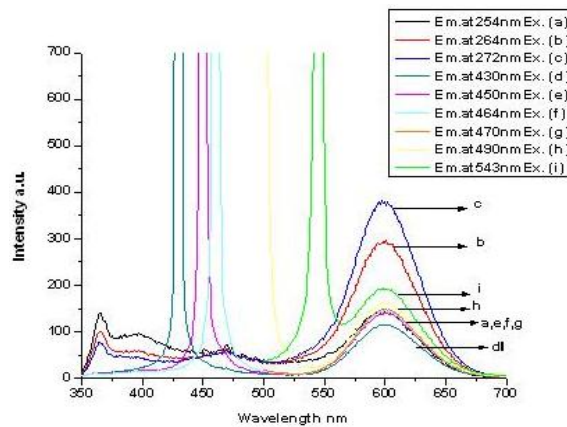


Fig. 2 : Emission spectra of SrS : Eu at different Excitations

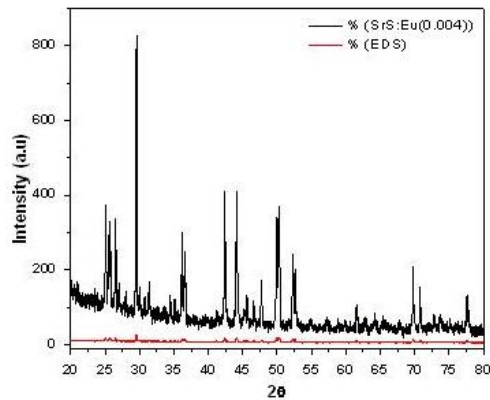


Fig.3 EDS and XRD of SrS:Eu(0.05)

**XRD:** It Fig.3 shows the EDS and XRD of Sr S:Eu (0.05). It is clear from XRD that the Phosphor is having crystalline nature having single phase when compared to JCPDS data.

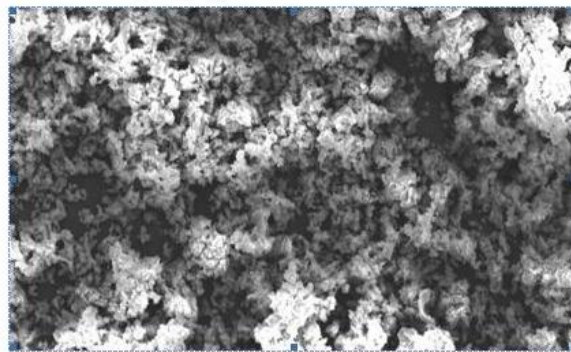


Fig. 4 SEM of Sr S:Eu (0.05)

**SEM:** Fig. 4 is SEM of Sr S:Eu (0.05).It is clear from the SEM, the average size of phosphor particle may be around 12-15 μm. Agglomerations of the phosphor material is seen from the SEM photograph.

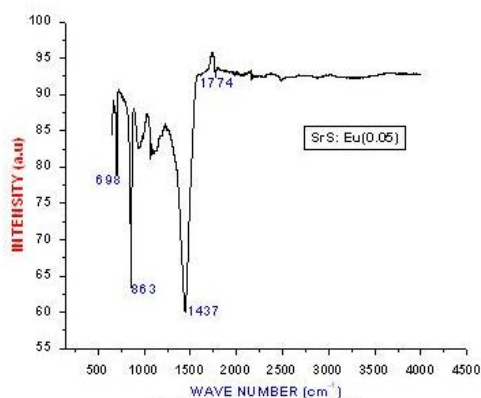


Fig. 2.12 FTIR of SrS:Eu(0.05)

Fig. 5 is FTIR of Sr S:Eu (0.05). From FTIR , the peaks at 698, 863,1437 and 1774 cm-1 attributed to metal oxide stretching.

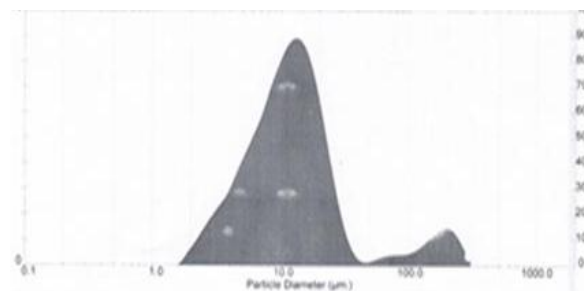


Fig. 6 is the particle size histogram of SrS: Eu (0.05). It is observed that various sized particles having sizes of 15  $\mu\text{m}$  , 80  $\mu\text{m}$  , and 300  $\mu\text{m}$  , of various percentages are present. From the data the average surface area of the phosphor particles of 1 Gram was found to be 0.672m<sup>2</sup>.

#### CONCLUSIONS

SrS: Eu synthesized in reducing atmosphere having been stabilized in 2+ states of Europium (5D<sub>2</sub>→ 7F<sub>0</sub> transition of Europium) which emitted a broad emission from 550nm to 650nm with a peaking at 600nm.

After careful study it is suggested, this phosphor will be a good candidate for LED application to generate white light from blue Semiconductor LED as a excitation source.

This phosphor SrS: Eu can be considered as good material for CFL, FL as green-red emitting material.

#### REFERENCES :

1. W.M.Yen, S. Shionoya and H. Yamamoto, Phosphor Handbook, CRC Press, Boca Raton, FL (USA) 2007.
2. Dexpert-Ghys, R. Mauricot, M.D. Faucher, *J. Lumines.* 69 (1996) 203
3. M. L. Pang, J. Lin, J. Fu, R.B. Xing, C. X. Luo, Y.C. Han, *Opt. Mat.* 23(2003)547
4. Y. Jing-hai, L. Wan-Yan, Y. Li-li, Z. Yang-Jun, W. Ya-Xin, F. Hou-gang, *Chem.Res. Chinese U.* 22(6) 2006)671

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#### AUTHOR INFORMATION:

##### **Chava Kishore Babu**

S.V.R.M. College, Nagaram, A.P

##### **B.Walter Ratna Kumar**

P.B.N.College, Nidubrolu, Guntur (Dist), A.P

##### **Dr. B.subba Rao**

V.S.R.&N.V.R. College, Tenali, A.P

##### **K.V.R. Murthy**

Applied Physics Department, M.S.University of Baroda, Baroda