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STUDIES ON LUMINESCENCE AND Eu^{3+} DOPED CALCIUM BROMO FLUORIDE PHOSPHOROUS

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ABSTRACT:

The current paper on Photoluminescence (PL) and Thermoluminescence (TL) report the properties of the rare earth-dope Calcium Bromofluoride Phosphorus. Europium (Eu^{3+}) was used as a rare earth dopant. Phosphorus is formed by solid state reaction method. The PL emission spectrum of the generated phosphor shows a sharp peak at 611nm for $^5D_0 \rightarrow {}^7F_2$ transition in the red region and a wide band located around 220 - 400 nm for a fixed emission wavelength of 470 nm excited PL.

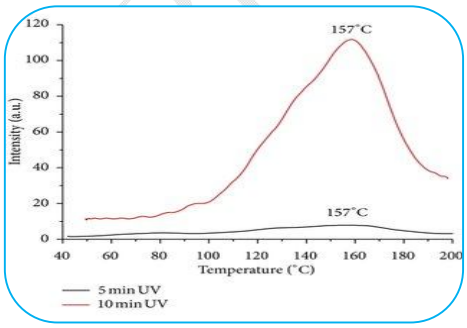
KEY WORDS: *Photoluminescence (PL) and Thermoluminescence (TL), generated phosphor.*

INTRODUCTION:

Rare earth-doped phosphors have been the centre of attraction as luminous substances for the past several decades. This phosphor is known as the host material for X-ray screens, neutron detectors, alpha particle scintillators, etc., and is also used as a viscous substance in various display devices such as LCDs, FETs, and plays in spectroscopic study of phosphorus. An important role in describing specific luminescence properties such as thermoluminescence. Rare earths are commonly used for celestial trial in this material for the sensation of optoelectronics in photonics and optoelectronics in plexuses. Europium is used efficiently as a luminescent center in phosphor for various purposes. Phosphorus doping with Europium ions is of more importance for monitoring red color on monitors of various display devices.

EXPERIMENT:

By the solid-state reaction process, CaF_2 KBr, and Eu_2O_3 were mixed in stoichiometric proportions and ground dry in mortar and pastel for approximately 50 minutes. This mixture was taken in a quartz boat and released into the air at a temperature of 8^0C in the presence of urea. Photoluminescence at 425 - 675 nm wavelength temperature was studied using RF 5304 Spectro photo fluorometer. Thermal imine scans were studied using TLD Reader I1009. The sample was deformed by UV radiation 375 nm. The heating rate used for TL measurement is 4^0C/s. The curves were analyzed using a computer glow curve convolution program.



RESULT AND DISCUSSION:

Study of Photoluminescence:

The PL excitation spectra of CAFBR (pure) phosphorus is tested at 480 nm. It displays a wide excitation band in the range of 230-410 nm. The

wide peak in the region of about 275 nm corresponds to the maximum EU^{3+}, while the weak stimulus seen at 358 nm may be due to the peak crystal field effect.

PL emission spectra of Eu^{3+} doped CAFBR phosphor was reported at an excitation wavelength of 275nm. The PL emission spectra of CAFBR at room temperature: Eu^{3+} phosphor 650 nm in Europe with a wavelength range of 400 to 0.1%, 0.2% and 0.5%, respectively. The transition from excited $^5D_1$ to $^7F_1$ and $^5D_0$ to $^7F_1$ results in different emission lines between 588 and 638 nm. From the emission level to the final level, the origin of this infection depends on the location of the EU INICFBR mesh and the type of infection is determined by selection rules. The acute peak at 621nm and the small peak at 628nm are awakened by an electrical bipolar transition mechanism that causes a hypersensitivity transition between the $^5D_0$ and $^7F_2$ levels Eu^{3+} ions in the Calcium Bromo Fluoride host. The magnetic dipole transition from $^5D_0$ to $^7F_1$ yields a weak emission of about 595 nm (595-605 nm).

Wide band peaking at 484 nm may be due to crystal field or host compound. All possible transitions of Eu^{3+} ions in the CAFBR host, comparison of PL intensity with the difference in the energy concentration of the Eu^{3+} ions in the CAFBR lattice with all possible bipolar transitions. This shows that the intensity decreases with increasing Europium concentration.

CIE:

Emission colours of CAFBR: Eu^{3+} phosphorus can be expressed by the Commission International de l'Eclarization (CIE) chromaticity coordinates. The resulting **CaFBr: Eu^{3+}** phosphor represents a red light, and its color coordinate is $x = 0.73$, $x = 0.38$

Study of Thermo luminescence:

CAFBR's thermo luminescence (TL) glow curve: **Eu^{3+}** phosphorus UV radiation, TL glow curve were reported for different UV doses and 30 cm hot rate for different **Eu** concentrations. TL glow curve for pure CAFBR for 5, 10, 15 and 30-min ultraviolet radiation. Remarkable brightness peaks are found at 113, 120, 95 and 101^{0}C. The pattern shows second-order dynamics. TL glow curve for CAFBR 9 and 18 minutes doped with 0.5% EU for UV radiation are notable glow peaks. The origin of this transition is up to 165^{0}C, this sample shows the first order speed.

Kinetic Parameter and its Determination:

Table 1.1 Kinematic Parameter for CaFBr doped

UV Min	T_1	T_m	T_2	T	δ	ω	μg = δ / ω	E	S
30 Min	140	190	218	50	35	84	0.43	0.60	$1X10^7$
40 Min	92	116	151	37	37	68	0.55	0.63	$2X10^9$
25 Min	73	118	136	50	23	69	0.58	0.47	$2X10^6$
20 Min	78	116	128	44	11	53	0.19	0.41	$5X10^6$
25 Min	105	134	164	37	33	64	0.52	0.74	$5X10^9$

The TL glow corresponds to the curve flow and the trap lying at different depths in the band distance between the dense valence bands. The levels of these traps are indicated by various trap parameters such as trap depth, velocity classification and frequency factor. The loss of dosimeter information stored in the material after radiation depends on the level of entanglement in the restricted distance which is called trap depth or activation energy (E). The mechanism of reconnecting the deviated charge carriers with their counter parts is known as the order of dynamics (b). The frequency factor (s) represents the number of times the trap hits the wall and the product of the reflection coefficient on the wall, assuming the trap is a potential well. Thus, the responsible doomsday study of the chemiluminescent content is based on its impedance parameters.

CONCLUSION:

CaFBe:Eu^{3+} successfully synthesized by solid state reaction method with different (0.1%, 0.2%, 0.3%) Eu^{3+} concentration, the photoluminescence measurement (λ_{exc} = 265 nm) corresponds to the Eu^{3+} allowed $^5D_0 \rightarrow {}^7F_0$, $^5D_0 \rightarrow {}^7F_1$, and $^5D_0 \rightarrow {}^7F_2$, respectively, showing intense red emission consisting of three bands in the middle of 578 nm, 611 nm, and 628 nm. CaFBe: Eu3+ represents Eu^{3+} red light and its colour coherence coordinates are x = 0.65 and x = 0.32. The chromaticity point is in the deep red region, which indicates high colour purity. Furthermore, this phosphor represents a strong red emitted phosphor at the photoluminescence emission peak at 611 nm. The value of activation energy is the highest for the EU (0.1%) CaFBe:Eu^{3+}. The value of activation energy for all EU concentration is between 0.40 to 0.804 eVs. The corresponding frequency component value is 6 x 10^5 to 2 x 10^{12} s^{-1}.

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