RESEARCH ARTICLE OPEN ACCESS

A Brief Review to Study of Preparation andPhotoluminescence (PL)Properties to Finding Possibilities ofDivalent Europium Doped Barium Magnesium Silicate BasedPhosphors

Sanjay Kumar Dubey[1], Shashank Sharma[2,] *

[1](Research Scholar,Department of Physics,Kalinga university, Atal Nagar, Nawa Raipur Chhattisgarh, INDIA)

Email: sanjaydubey2166@gmail.com

[2](Research Scholar,Department of Physics,Kalinga university, Atal Nagar, Nawa Raipur Chhattisgarh, INDIA)

Email: shashanksharma1729@gmail.com

----------**********----------

Abstract:

This present review article deals with theluminescent property of $Ba_XMgSi_2O_{5+X}:Eu^{2+}$(X=1, 2, 3) Basedphosphor will be thermally treated product sample will be heating in muffle furnace fired at different temperature of composition prepared by conventional combustion method. The product sample will be investigated for their photoluminescence characteristics prior to afterglow decay measurements will irradiated by 305nm UV region. Finding Possibilities to high-tech and environmental application area that the great innovation ofeco-friendlyand lighting devices.

Keywords- ***Long persistent phosphor, Photoluminescence (PL), UV (ultra violet).***

----------**********----------

CONSIDERATIONS

Technological development has been greater milestone by providing light sources to human mankind as well as having the characteristics of accuracy, reliability and integrity. In the past few decades there hasbeen a widely revolution in Luminescence society area of researchto all indications through technological progress and use of nanotechnology will continue at a rapid pace. Accompanying can supporting the dramatic increases in the power and use of new rare earth doped long persistent phosphors or nanomaterials has been the declining cost of innovations as a result of both materialistic improvements and increased competition making new display lighting devices made them smaller, more powerful, more accessible and cheaper. Thus, there are many more discoveries such as this will help mankind move one step further.

Luminescence is the great innovation area who have indicates that cold emission of light source of energy. The world-widerecent trends in physical sciences towards applied research relevant to conservation of energy [1-3]. Some substantial developments have taken place in the field of luminescence. In 1652 Zechi who have greatly contributed to unique properties of luminescence it is called “Photoluminescence”. The phenomenon of Photoluminescence which is clearly indicated to scattering. The phosphorescence material in light is clearly independent of the colour of excitation light. According to Stokes law photoluminescent material is widely increases emission light wavelength [4].

Alkalineearth metal (Ca, Sr, Ba) rare earth doped silicates are widely studied in few recent years which characteristics such as better brighter luminescent emission wavelength, easier preparation, cheaper and more accessible properties compared than another material [5, 6, 7, 8].The discovery of blue LED in the last century towards the

illumination source of low energy with a high efficiency.Considerably, alternative energy source is reducing consumption of power [9-12].

First time investigated that alkaline earth metal silicate-based bio ceramics for tissue engineering who have alsostudied to be cost effective and more efficient combustion method both akermanite($Ca_2MgSi_2O_7$and $Sr_2MgSi_2O_7$)structure, which is goodbioactivity approaches.ThePL study of both akermniteshows host centre emission of Eu^{2+} [13].
Earlier studies, more advantages to excellent thermal intense light emission wavelength, and chemical stability, energy consuming luminescent properties of rare earth doped silicate materials [14-15].ErkulKaracaogu et al studied that different rare earth doped $Ca_2MgSi_2O_7$ was prepared by solid-state reaction method under weak reduction atmosphere. Some physical structure and PL properties of the samples have been studied respectively [16].

$Ca_2MgSi_2O_7$have been widely interesting from the manufacturing because it is clearly indicating to good qualities of product sample, stability, energy consumed, because both calcium and silica are abundant and relatively inexpensive [17-18].Matsuzawa et al widely studied, blue, green and red long persistent $SrAl_2O_4:Eu^{2+}$, Dy^{3+} phosphor developed over the visible light region. This phosphor brightness and persistent time are not longer to applicable to practical overview [19].

PL characteristics of $Sr_2SiO_4:Eu^{2+}$, Dy^{3+} phosphors are afterglow under UV and VUV excitation of light on truly described to monoclinic crystalstructure[20].The emission wavelength finds at(580nm), $Li_2SrSiO_4:Eu^{2+}$ (500–520nm), $Ba_9Sc_2Si_6O_{24}:Eu^{2+}$, (600nm) $Ca_3Si_2O_7:Eu^{2+}$phosphors which have been impact of the emission ion exhibits to trapped centre in the host electron [21].Eu^{2+} is a most common emission centre in persistent material hosted by the $4f^7 \rightarrow 4f^6 5d^1$ transition [22-23].

The study of $Sr_2SiO_4:Eu^{2+}$, Dy^{3+} phosphors was prepared through combustion method. Monoclinic structure and the average crystallite size were calculated as 12.77 nm. The single glow peak which TL glow curves were measured using Chen's glow curve method [24].

The present investigation reviewed with respect to preparation of nanocrystalline and microcrystalline$Ba_XMgSi_2O_{5+X}:Eu^{2+}$(X=1, 2, 3) phosphor via combustion synthesis method will be used. To stochiometric ratio amount to regent grade mixture of respective metal nitrates, flux and combustion agent will be thermally treated with slight modification nanocrystalline phosphor at 650^oC for about 5 min, and product sample will be annealed in muffle furnaceat 1150^oC temperature for 3 to 4 hours to find the microcrystalline phosphors.To measurement of PL characteristics of phosphor prior toafterglow decay measured will be irradiated to 305 nm overhigh intense emission wavelength in ultra violet region.
This review paper to study focused on very excellent possibilities to the synthesis of divalent europium doped Barium magnesium silicate based micro and nano phosphorsynthesis process mechanism to improvisation to the properties of crystal structure, characteristics, Emission and Excitation spectra, good features, much better possibilities. Finding applications areoptical lighting devices depend conditions by a magnitude of high thermal intense emission wavelength. The various acceptations of photoluminescence study clearly offered to new challenging and providing problems to optical display and lighting devices for the researchers, scientists and technologists.

REFERENCES

1. D. R.Vij;Lumin. of Solids Plenum press New York 1998.
2. S.W.S. McKeever; Books:(9780521368117); Thermoluminescence of Solids (Cambridge Solid State Science Series) 1985.
3. V.B. Mikhailik and H.Kraus; J. Lumin. 129 ,945, 2009.
4. B.P.Chandra; J. Phys. D, Appl. Phys. 17, 117, 1984.
5. B.P.Chandra;V.K. Chandra; P. Jha;J.Lumin; 135, 139-153, 2013.
6. Y.Chen; X. Cheng; M. Liu; Z. Qi.; C. Shi; Comparison study of the luminescent properties of the white-light long afterglow phosphors: $Ca_2MgSi_2O_7$: Dy^{3+}, J. Lumin., v. 129, n. 5, p. 531-535, 2009.
7. P. Chandrakar; D. P.Bisen;R. N.Baghel; B. P. Chandra; Synthesis and Optical Properties of $CaMgSi_2O_6$: Ce^{3+} Phosphors. J. Electron. Mater., v. 44, n. 10, p. 3450-3457, 2015.
8. Fei, Q.; Chang, C.; Mao, D. Luminescent properties of $Sr_2MgSi_2O_7$ and $Ca_2MgSi_2O_7$ long lasting phosphors activated by Eu^{2+}, Dy^{3+} J. Alloys. Compd., v. 390, n. 1-2, p. 133-137, 2005.

9. H. He; R.Fu; X. Song; R. Li; Z. Pan; X.Zhao; Z. Deng;Y. Cao; Observation of fluorescence and phosphorescence in $Ca_2MgSi_2O_7:Eu^{2+}$, Dy^{3+} phosphors. J. Electro chem. Soc., v. 157, n. 3, p. J69-J73, 2010.
10. M. S. Shur and A. Zukauskas; Proc. IEEE, 93, 1691, 2005.
11. G. Fasol and S. Nakamura; The Blue Laser Diode; Springer, Berlin 1997.
12. E. F. Schubert and J. K. Kim; Science, 308, 1274, 2005.
13. B V Bhatkar and N V Bhatkar; Combustion synthesis and photoluminescence study of silicate biomaterials, Bull. Mater. Sci., Indian Academy of Sciences, Vol. 34, No. 6, 1281–1284, 2011.
14. M. O.Onani; F. B. Dejene; Photo-luminescent properties of a green or red emitting Tb^{3+} or Eu^{3+} doped calcium magnesium silicate phosphors. Physica B: Condens. Matter, v. 439, p. 137-140, 2014.
15. T.G. V. M. Rao; A. Rupesh Kumar; N. Vee raiah; M. Rami Reddy; Optical and structural investigation of Sm^{3+}–Nd^{3+} co-doped in magnesium lead borosilicate glasses, J. Phys. Chem. Solid 74, 410–417, 2013.
16. ErkulKaracaoglu;Bekir Karasu;Esra Ozturk; Advances in Science and Technology, Trans Tech Publications, Switzerland, Vol. 90, 133-140, 2014.
17. G.C. Righini and M. Ferrari; Photoluminescence of rare-earth–doped glasses Rivista Del Nuovo Cimento DOI 10.1393/ncr/i2006-10010-8 Vol. 28, N. 12 2005.
18. I. P. Sahu, D. P. Bisen, N. Brahme, Lumin. J. Biol. Chem. Lumin. 30(7), 1125, 2015.
19. Matasuzawa Xiu feng S., Xinran Z., P. Zhengfei; J Mater Sci: Mater Electron 20, 433, 2009.
20. Dutczak Danuta;Milbrat Alexander;KatelnikovasArtura;MeijerinkAndries; Ronda Cees; Justel Thomas;Yellow persistent luminescence of $Sr_2SiO_4:Eu^{2+}$, Dy^{3+}, Journal of Luminescence 132: 2398–2403, 2012.
21. Kenji Toda;Toshitaka Kawakami; Shin-ichiroKousaka; Yutaka Ito; Akira Komeno; Kazuyoshi Uematsu; and Mineo Sato; New Silicate Phosphors for a White LED, Ieice Trans. Electron., Vol.E89–C, No.10 October 2006
22. G. Blasse; W.L. Wanmaker; J. W. Tervrugt, et al.; Philips. Res. Rep. 23, 189, 1968.
23. K. Yamazaki; H. Nakabayashi; Y. Kotera, a. Ueno, J. Electrochem, Soc. 133, 657, 1986.
24. D.Verma; R.P.Patel; M.L. Verma; Mat. Sc. Poland DOI: 10.1515/msp-0029, 2018.

BIOGRAPHIES

Sanjay Kumar Dubey, Ph.D Research Scholar,Dept. of Physics,Kalinga University Atal Nagar Nawa Raipur(Chhattisgarh), Indiaand Assistant professor, Dept. of Physics**,** Dr.Radhabai Govt. Navin Girls College Raipur(chhattishgarh)**.Teaching experience- 28 years**

Shashank Sharma, Ph.D Research Scholar, Dept. of Physics, Kalinga University Atal Nagar Nawa Raipur(Chhattisgarh), India and Former Inspire Scholar since 2013 to 2018 and Inspire Research Fellowship Holder MHRD New Delhi Since 2018 to till now. Inspire research Project completed to Guru Ghashidas Central university Bilaspur(chhattishgarh) since 2016 entitled **"Barium Stannate Thin film Sol-gel process using Spin Coating Technique".**

