

Printed from

# Journal of Scientific Research

<http://www2.univ-bechar.dz/jrs/>

## Fluorescence and Thermoluminescence (TL) studies of Ce doped BaMgAl<sub>10</sub>O<sub>17</sub> phosphor

Avinash ZAMBARE<sup>1</sup>, Chandrakant DIGHAVKAR<sup>2</sup>, V.NATRAJAN<sup>3</sup> and K.V.R.MURTHY<sup>4</sup>

<sup>1</sup> Department of Physics, Agasti Arts, Commerce & D.R. Science College, Akole  
Tal- Akole, Dist- Ahmednagar, Pin – 422 601. Maharashtra, India.

<sup>2</sup> Dept.of Electronics, L.V.H. College, Panchavati, Nashik-422003, Maharashtra, India.

<sup>3</sup> Radio Chemistry Division, BARC, Mumbai - 85.

<sup>4</sup> Applied Physics Department, Faculty of Tech. & Engg., Kalabhavan, Baroda –1

Corresponding author: [avinashzambare2003@yahoo.co.in](mailto:avinashzambare2003@yahoo.co.in)

Published on 30 June 2012

The Editor, on behalf of the Editorial Board and Reviewers, has great pleasure in presenting this number of the Journal of Scientific Research. This journal (ISSN 2170-1237) is a periodic and multidisciplinary journal, published by the University of Bechar. This journal is located at the interface of research journals, and the vulgarization journals in the field of scientific research. It publishes quality articles in the domain of basic and applied sciences, technologies and humanities sciences, where the main objective is to coordinate and disseminate scientific and technical information relating to various disciplines.

The research articles and the development must be original and contribute innovative, helping in the development of new and advanced technologies, like the studies that have concrete ideas which are of primary interest in mastering a contemporary scientific concepts. These articles can be written in Arabic, French or English. They will not be published in another journal or under review elsewhere. The target readership is composed especially of engineers and technicians, teachers, researchers, scholars, consultants, companies, university lab, teaching techniques and literary ... The journal is obtainable in electronic form, which is available worldwide on the Internet and can be accessed at the journal URL:

<http://www2.univ-bechar.dz/jrs/>.

## Director of Journal

Pr. BELGHACHI Abderrahmane

## Editor in Chief

Dr. HASNI Abdelhafid

## Co-Editor in Chief

Dr. BASSOU Abdesselam

## Editorial Member

Mr. TERFAYA Nazihe

Mr. BOUIDA Ahmed

Mr. LATFAOUI Mohieddine

Mr. OUAHABI Abdelhakim

## Reviewers board of the Journal.

Pr. KADRY SEIFEDINE (The American University in KUWAIT)  
Pr. RAZZAQ GHUMMAN Abdul (Al Qassim University KSA)  
Pr. PK. MD. MOTIUR RAHMAN (University of Dhaka Bangladesh)  
Pr. MAHMOOD GHAZAW Yousry (Al Qassim University KSA)  
Pr. KHENOUS Houari Boumediene (King Khalid University KSA)  
Pr. RAOUS Michel (Laboratory of Mechanic and Acoustic France)  
Pr. RATAN Y. Borse (M S G College Malegaon Camp India)  
Pr. LEBON Frédéric (University of Aix-Marseille 1 France)  
Pr. MONGI Ben Ouédou (National Engineering School of Tunis)  
Pr. BOUKELIF Ouéd (University of Sidi Bel Abbes Algeria)  
Pr. DJORDJEVICH Alexander (University of Hong Kong)  
Pr. BENABBASSI Abdelhakem (University of Bechar Algeria)  
Pr. BOULARD Thierry (National Institute of Agronomic Research France)  
Pr. LUCA Varani (University of Montpellier France)  
Pr. FELLAH Zine El Abidine Laboratory of Mechanic and Acoustic France)  
Dr. ZHEN Gao (University of Ontario Institute of Technology Canada)  
Dr. OUERDACHI Lahbassi (University of Annaba Algeria)  
Dr. HADJ ABDELKADER Hicham (IBISC – University of Evry France)  
Dr. KARRAY M'HAMED ALI (National Engineering School of Tunis)  
Dr. ALLAL Mohammed Amine (University of Tlemcen Algeria)  
Dr. FOUCHAL Fazia (GEMH - University of Limoges France)  
Dr. TORRES Jeremi (University of Montpellier 2 France)  
Dr. CHANDRAKANT Govindrao Dighavka (L. V. H. College of Panchavati India)  
Dr. ABID Chérifa (Polytech' University of Aix-Marseille France)  
Dr. HAMMADI Fodil (University of Bechar Algeria)  
Dr. LABBACI Boudjema (University of Bechar Algeria)  
Dr. DJERMANE Mohammed (University of Bechar Algeria)  
Dr. BENSAFI Abd-El-Hamid (University of Tlemcen)  
Dr. BENBACHIR Maamar (University of Bechar Algeria)

Pr. BALBINOT Alexandre (Federal University of Rio Grande do Sul Brazil)  
Pr. TEHIRICHI Mohamed (University of Bechar Algeria)  
Pr. JAIN GOTAN (Materials Research Lab., A.C.S. College, Nandgaon India)  
Pr. SAIDANE Abdelkader (ENSET Oran Algeria)  
Pr. DI GIAMBERARDINO Paolo (University of Rome « La Sapienza » Italy)  
Pr. SENGOUGA Nouredine (University of Biskra Algeria)  
Pr. CHERITI Abdelkarim (University of Bechar Algeria)  
Pr. MEDALE Marc (University of Aix-Marseille France)  
Pr. HELMAOUI Abderrachid (University of Bechar Algeria)  
Pr. HAMOUINE Abdelmadjid (University of Bechar Algeria)  
Pr. DRAOUI Belkacem (University of Bechar Algeria)  
Pr. BELGHACHI Abderrahmane (University of Bechar Algeria)  
Pr. SHAILENDHRA Karthikeyan (AMRITA School of Engineering India)  
Pr. BURAK Barutcu (University of Istanbul Turkey)  
Dr. SELLAM Mebrouk (University of Bechar Algeria)  
Dr. ABDUL RAHIM Ruzairi (University Technology of Malaysia)  
Dr. BELBOUKHARI Nasser (University of Bechar Algeria)  
Dr. CHIKR EL MEZOUAR Zouaoui (University of Bechar Algeria)  
Dr. BENACHAIBA Chellali (University of Bechar Algeria)  
Dr. KAMECHE Mohamed (Centre des Techniques Spatiales, Oran Algeria)  
Dr. MERAD Lotfi (Ecole Préparatoire en Sciences et Techniques Tlemcen Algeria)  
Dr. BASSOU Abdesselam (University of Bechar Algeria)  
Dr. ABOU-BEKR Nabil (Universit of Tlemcen Algeria)  
Dr. BOUNOUA Abdennacer (University of Sidi bel abbes Algeria)  
Dr. TAMALI Mohamed (University of Bechar Algeria)  
Dr. FAZALUL RAHIMAN Mohd Hafiz (University of Malaysia)  
Dr. ABDELAZIZ Yazid (University of Bechar Algeria)  
Dr. BERGA Abdelmadjid (University of Bechar Algeria)  
Dr. Rachid KHALFAOUI (University of Bechar Algeria)  
Dr. SANJAY KHER Sanjay (Raja Ramanna Centre for Advanced Technology INDIA)

## Journal of Scientific Research

P.O.Box 417 route de Kenadsa

08000 Bechar - ALGERIA

Tel: +213 (0) 49 81 90 24

Fax: +213 (0) 49 81 52 44

Editorial mail: [jrs.bechar@gmail.com](mailto:jrs.bechar@gmail.com)

Submission mail: [submission.bechar@gmail.com](mailto:submission.bechar@gmail.com)

Web: <http://www2.univ-bechar.dz/jrs/>



# FLUORESCENCE AND THERMOLUMINESCENCE (TL) STUDIES OF Ce Doped BaMgAl<sub>10</sub>O<sub>17</sub> PHOSPHOR

Avinash ZAMBARE<sup>1</sup>, Chandrakant DIGHAVKAR<sup>2</sup>, V.NATRAJAN<sup>3</sup> and K.V.R.MURTHY<sup>4</sup>

<sup>1</sup>Department of Physics, Agasti Arts, Commerce & D.R. Science College, Akole  
Tal- Akole, Dist- Ahmednagar, Pin – 422 601. Maharashtra, India.

[E-mail-avinashzambare2003@yahoo.co.in](mailto:E-mail-avinashzambare2003@yahoo.co.in)

<sup>2</sup> Dept.of Electronics, L.V.H. College, Panchavati, Nashik-422003, Maharashtra, India.

<sup>3</sup>Radio Chemistry Division, BARC, Mumbai - 85.

<sup>4</sup>Applied Physics Department, Faculty of Tech. & Engg. ,Kalabhavan, Baroda –1

[E-mail-drmurthykvr@yahoo.com](mailto:E-mail-drmurthykvr@yahoo.com)

---

**Abstract** – In the present paper reports Barium Magnesium Aluminates doped Ce is synthesized by solid state reaction. Fluorescence study of Ce doped BaMgAl<sub>10</sub>O<sub>17</sub> phosphor exhibit the excitation of the material with 317nm wavelengths generates a strong emission at 676 nm in far infrared region. Thermoluminescence glow curves were carried out on phosphor of gamma irradiated Ce doped BaMgAl<sub>10</sub>O<sub>17</sub>. The BaMgAl<sub>10</sub>O<sub>17</sub>:Ce phosphor irradiated (10<sup>5</sup>R) exhibits two well defined peaks at 230°C and 330°C along with hump at 140°C temperature are observed, the first being the intense one and well defined than other peak.. These changes are may be possible due to electronic charges and sizes of these added impurities.

**Keywords:** BaMgAl<sub>10</sub>O<sub>17</sub>, Ce; phosphor; Fluorescence; Thermoluminescence; Peaks

---

## I. Introduction

The fluorescence examination of phosphors brings out number of information and throws light on the use of materials as fluorescent lamp phosphors. In present paper, the excitation and emission spectra of synthesized phosphors have been recorded at room temperature. The emission spectra have been examined for the number of RE activated BaMg- aluminates and the characteristic spectra are presented for discussion. The emission band is specified by the wavelength at which its peak appears. Some times, changes in the relative intensities of the component within a composite band would give rise to apparent shift in the position of its maximum. In that cases, the standard emission /excitation positions have been mentioned. The intensities of the emission as well as excitation bands are given in absolute units.

Thermoluminescence radiation dosimetry (TLD) is a very good technique of research in luminescence field. Many researchers have done tremendous work in this field to establish new TLD phosphors<sup>(1)</sup>. The well known phosphors developed are LaPO<sub>4</sub>:Tb, NaCl:Ca, Ca{Po<sub>4</sub>}F Cl:Sb,Mn, NaCl:Tb, LiYF<sub>4</sub>:U<sup>4+</sup>, CaSO<sub>4</sub>:Dy, LaPO<sub>4</sub>:Ce: Tb and aluminates in mono-,dia and tri-valent doped forms<sup>(1-8)</sup>. The present paper TL-properties of BaMgAl<sub>10</sub>O<sub>17</sub> doped with impurities Ce have been examined in order to investigate the effect of impurities on TL- behavior of BaMg-aluminates and to find out the peak suitable for

dosimetric application. The phosphor can be used for compact fluorescent lamp for the protection from insects

## II. Experimental

The phosphor of Ce doped with BaMgAl<sub>10</sub>O<sub>17</sub> have been synthesized by solid state reaction<sup>(9)</sup>. The appropriate oxides were thoroughly ground and fired at 1200°C for four hours. The specimens thus obtained have been characterized through standard XRD technique. Fluorescence excitation and emission spectra was recorded at room temperature by Hitachi' model F-4500 system described elsewhere. Thermoluminescence glow curves were recorded at room temperature by using standard experimental set-up described elsewhere. The fluorescence excitation / emission spectra and TL glow curves are recorded at room temperature and are presented in the figure 1, 2 and 3.

## III. Result and Discussions

Figures 1 & 2 respectively exhibit the excitation and emission spectra of BaMgAl<sub>10</sub>O<sub>17</sub>:Ce phosphor.

It indicates that the excitation of the material with 317nm wavelengths generates a strong single emission peak at 676nm in far infrared region.

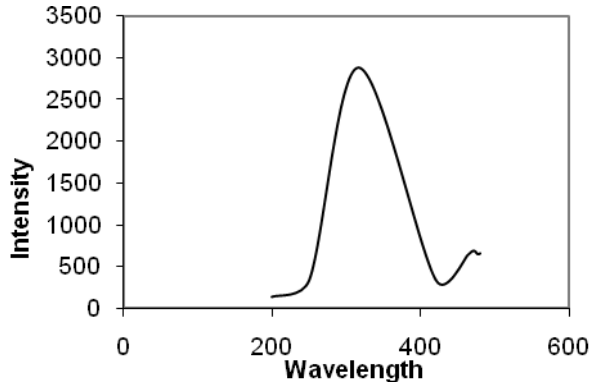


Figure 1. Represents excitation spectra of Ce doped BaMg-aluminates.

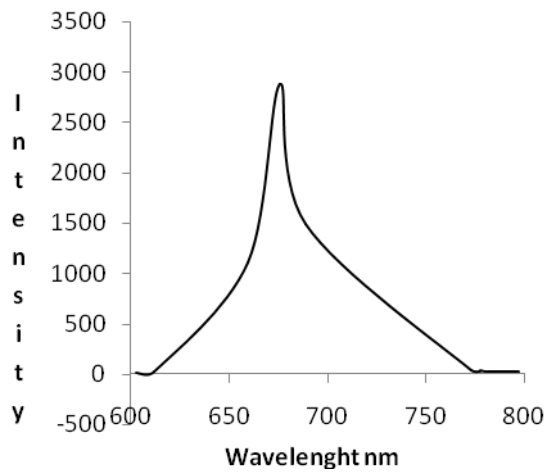


Figure 2. Represents emission spectra of BaMgAl<sub>10</sub>O<sub>17</sub> : Ce with excitation at 317 nm.

The glow curves of the Ce doped BaMg aluminates have been recorded for temperature range 25° to 400°C with uniform heating rate (300°C/min), under influence of three standard gamma doses 10<sup>5</sup>R. The speed of X-Y recorder was 1 mv/cm. Figure 2 respectively exhibit the TL glow curve observed in Ce activated BaMgAl<sub>10</sub> O<sub>17</sub> phosphors.

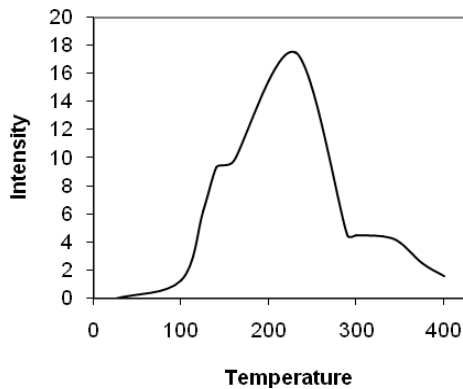


Figure 3. Represents TL glow curve of Ce doped BaMgAl<sub>10</sub> O<sub>17</sub>

It is observed that develops phosphor irradiated with 10<sup>5</sup>R exhibits a strong peak at 230°C and humps on ascending and descending sides of it around 140°C and 330°C respectively. The 230°C peak seems to be the property of Ce impurity in BaMg aluminate. The trap parameters viz.: activation energy (E), frequency factor (S) are determine by different heating rates method and order of kinetics are determine by peak shape method for the prominent peak are given in Table 1.

Peak Temp (°C)	Activation energy (E) (eV)	Frequency Factor (S) Sec <sup>-1</sup>	Order of Kinetics 1 <sup>st</sup> order	Probability (ρ) Sec <sup>-1</sup>
140	1.9	9.7x10 <sup>22</sup>	-	-
230	1.3	3.1x10 <sup>12</sup>	0.2	0.295
330	2.0	1.6x10 <sup>16</sup>	-	-

Table 1 Trap parameters

#### IV. Conclusion

The experimentally observed changes in TL properties of BaMg-aluminates can be explain on the promise of change in micro-electrical and mechanical fields in host lattice created due to differences in charge and sizes of impurities introduce in BaMg-aluminates. It is believed that the peak around 230°C in doped BaMg-aluminates is isolated, well defined and intense one, therefore it may be useful in TL- dosimetry. Detail and systematic dosimetric studies may strengthen the utility of these phosphors in radiation dosimetry.

#### References

- [1]. 13<sup>th</sup> Int. Conf. On Solid state dosimetry 9-13 July 2001, Athens, Greece, Progrme and Abstracts.
- [2]. Proc. Int. Conf. On Luminescence and its applications Vol. 1&2 Edited by K.V.R.Murthy et.al Dec. 2000, Publ. By M.S.University of Baroda.
- [3]. A.L.N. stevels and A.D.M. Schrama-De Pauw, Journal of Luminescence, 14, pp.147-152, (1976).
- [4]. B. Smets, J. Rutten, G. hoeks and J. Verlijdsdonk, J. Electrochemical. Soc., Vol.136, No.7, pp.2119-2123, (July 1989).
- [5]. J.M. P.J. Verstegen and A.L.N. Stevels, Journal of Luminescence

- [6]. A.L.N. Stevels, Journal of Luminescence, 17, pp.121-133, (1978).
- [7]. B.M.J. Smets, Mater. Chem. Phys., 16, 283, (1987) 11, 9, pp.406-414, (1974).
- [8]. T.R.Joshi, K. P. Dhake, A. K. Nehate and C.Dighavkar, Bulletin of Electrochemistry, 5(3) March 1989, PP 217-220.
- [9]. K.C.Patil et.al Bull. Material sci. vol-18 No.7 Nov.1995, PP 922-930.

---

## **Journal of Scientific Research**

**P.O.Box 417 route de Kenadsa  
08000 Bechar - ALGERIA  
Tel: +213 (0) 49 81 90 24  
Fax: +213 (0) 49 81 52 44  
Editorial mail: [jrs.bechar@gmail.com](mailto:jrs.bechar@gmail.com)  
Submission mail: [submission.bechar@gmail.com](mailto:submission.bechar@gmail.com)  
Web: <http://www2.univ-bechar.dz/jrs/>**

---