$CaMgSi_2O_6:Eu^{2+}$and Dy^{3+} co doped phosphors prepared by combining two chemical method

C. Yamagata[1*], A. M. Misso[1], S. R. H. Mello-Castanho[1], Hermi F. Brito[2], Lucas C. V. Rodrigues[2]

[1]*Instituto de Pesquisas Energéticas e Nucleares, Centro de Ciência e Tecnologia de Materiais, São Paulo, Brazil,* [2] *Universidade de São Paulo, Instituto de Química, SP, Brazil*
** Corresponding author: yamagata@ipen.br*

Silicate system of the $CaO–MgO–SiO_2$ has attracted great interest due to its high weather resistance which is endorsed by the physical and chemical stability [1, 2]. This property makes it applicable as host for luminescent materials. $CaMgSi_2O_6$ (diopside), an important component of the mantle and subduction slabs has been studied by many researchers [3]. Eu^{2+} activated alkaline earth silicate phosphors have a long afterglow characteristic and blue to green emission by the near ultraviolet [4] stimulation. Glass ceramic of $CaO–MgO–SiO_2$ system has potential application on the optical devices [5, 6], for example, $Ca_2MgSi_2O_7:Eu^{2+}$ [7] and $CaMgSi_2O_6:Eu^{2+}$, Dy^{3+} [8]. $Ca_2MgSi_2O_7$: Eu^{2+} is a promising phosphor material for white light emitting diode (LED) [5]. In this study, $CaMgSi_2O_6:Eu^{2+}$ and Dy^{3+}co-doped $CaMgSi_2O_6:Eu^{2+}$ phosphors were synthesized using sol gel technique followed by a modified molten salt method and thermal treatment in a weak reducing atmosphere. Crystalline phase identification by XRD and the measurements of photoluminescence (PL) excitation were performed. The XRD results reveal that the synthesized phosphors are crystalline and assigned to the diopside structure. The PL results indicate the emission spectra of $CaMgSi_2O_6:Eu^{2+}$ and Dy^{3+} co-doped $CaMgSi_2O_6:Eu^{2+}$ phosphors have a broad band at 450nm attributed to electronic transition from the $4f^6\ 5d^1$ state to the $4f^7$ state.

Keywords: $CaMgSi_2O_6:Eu^{2+}$ (Dy^{3+}), phosphors, synthesis, XRD, photoluminescence

Acknowledgements

This work was supported by CNPq and FAPESP.

References

[1] P. Alizadeh, V.K. Marghussian, J. Eur. Ceram. Soc. 20 (2000) 765–773.
[2] C. Fredericci, E.D. Zanotto, E.C. Ziemath, J. Non-Cryst. Solids 273 (2000) 64–75.
[3] T. Irifune, M. Miyashita, T. Inoue, J. Ando, K. Funakoshi, W. Utsumi, Geophys. Res. Lett. 27 (2000) 3541-3544.
[4] T. Kunimoto, R. Yoshimatsu, K. Ohmi, S. Tanaka, H. Kobayashi, IEICE Trans. Electron. 11 (2002) 1888-1894.
[5] M. Zhang, J. Wang, W. Ding, Q. Zhang, Q. Su, Optical Materials 30 (2007) 571–578.
[6] J. Cheng, P. Tian, L. Tang, et al., J. Chn. Ceram. Soc. 36 (2008) 1017–1021.
[7] F. Qin, C. Chang, D. Mao, J. Alloys Compd. 390 (2005) 133–137.
[8] L. Jiang, C. Chang, D. Mao, et al., J. Alloys Compd. 377 (2004) 211–215.