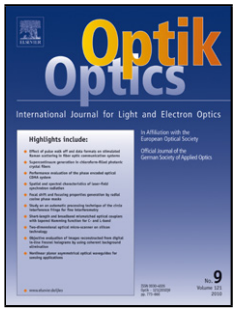

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Author: R.B. Basavaraj H. Nagabhushana B. Daruka Prasad S.C. Sharma S.C. Prashantha B.M. Nagabhushana

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A single host white light emitting Zn_2SiO_4:Re^{3+} (Eu, Dy, Sm) phosphor for LED applications

R.B.Basavaraj[1], H. Nagabhushana[1*], B. Daruka Prasad[2], S.C.Sharma[3], S.C. Prashantha[4*], B.M. Nagabhushana[5]

[1]*Prof. C.N.R. Rao Centre for Advance Materials Research, Tumkur University, Tumkur-572103, India*
[2]*Department of Physics, B M S Institute of Technology, Bangalore – 560 064, India.*
[3]*Dayananda Sagar University, Shavige Malleshwara hills, Kumaraswamy layout, Bangalore 560 078,* India
[4]*Department of Science, East west Institute of Technology, Bengaluru-560091, India.*
[5]*Department of Chemistry, M.S. Ramaiah Institute of Technology,Bangalore- 560 054, India.*

Abstract

We report photo and thermoluminescence properties of Zn_2SiO_4: Re^{3+} (Eu, Dy, Sm) phosphors prepared by low temperature solution combustion technique. The hexagonal phase was confirmed by PXRD patterns. SEM micrographs revealed that morphological features were highly dependent on type of the dopant ion. Characteristic excitation and emission peaks of Eu^{3+}, Dy^{3+} and Sm^{3+} were observed from PL studies. The concentration quenching occurred for 3 mol% R^{3+} doped lanthanide ions, whose critical energy transfer distance (R_c) was found to be ~13 Å. The corresponding concentration quenching was verified to be dipole-dipole interaction. The chromaticity co-ordinates of Zn_2SiO_4:Eu^{3+}/Dy^{3+}/Sm^{3+} phosphors were located in white region suggests them to be a potential candidate for the production of white light emitting phosphors. Three TL glow peaks in Eu^{3+}, Dy^{3+} doped and two glow peaks in Sm^{3+} doped Zn_2SiO_4 nanophosphor observed in TL studies indicated that more than one type of traps were created in these phosphors. TL intensity increases linearly in Sm^{3+} doped Zn_2SiO_4 upto 4 kGy and thereafter, it decreases. Upto 4 kGy, the phosphor was quite useful in radiation dosimetry.

Key words: Nanophosphors; morphological studies; luminescence; WLEDs; dosimetry

* Corresponding author. Tel.: +91 9945954010, Tel.: +91 9886021344
E-mail: bhushanvlc@gmail.com (H. Nagabhushana). scphysics@gmail.com (Prashantha S.C)