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Thermoluminescence and Photoluminescence properties of Europium doped Ba_2SiO_4 phosphor

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ABSTRACT

An orange-red emitting phosphor Ba_2SiO_4doped with europium ion with variable concentrations (0.2 – 1.5mol%) was synthesized by modified solid state reaction method. The phosphor $Ba_2SiO_4:Eu^{3+}$ was characterized by X-ray diffraction technique for structural analysis and scanning electron microscopy (SEM) for morphological studies. A single prominent glow peak was found at 146 °C which indicates that only one trap centre is formed in the sample.Sample show good TL glow curves for variableă-ray exposure time. The peak shape method was used to calculate kinetic parameters (activation energy and frequency factor).The resultsconfirm that $Ba_2SiO_4:Eu^{3+}$phosphor may be useful inradiation dosimetry.PL emission spectra consists prominent peaks ataround 594 and 614 nm in orange-red region when excited by 394nm wavelength.

Keywords : $Ba_2SiO_4:Eu^{3+}$; XRD; SEM; Thermoluminescence; Photoluminescence.

1. Introduction

Due to suitable energy band structure, high chemical stability, easy preparation and low-cost properties, silicates are the good hosts for the development of phosphors.Ca_2SiO_4 and Ba_2SiO_4 activated with Eu^{2+} were studied at different temperature which show green, orange emission band [1, 2].The long-lasting phosphor $Ba_2SiO_4:Eu^{2+}$ show a great application for X-ray technique and cathode ray tube [3].Eu^{2+} activated Li_2SrSiO_4 phosphor used as solid-state lighting [4, 5]. Light-emitting diodes (LEDs) for solid state lighting have significant potential in terms of energy savings and environmental advantages, and are expected to replace most gas discharge fluorescent lamps in the near future [6, 7]. The trivalent rare-earth ion plays a role of efficient emitter in various types of host materials having wide application in lighting world. Among the different RE species, Eu is the special rare earth element as an activator for the hosts, because it exists in divalent and as well as in trivalent also, and hence due to different valance it shows different optical properties [8].

There are few reports found on Ba_2SiO_4phosphor only on photolu-minescence, However the prepared material was studied another important luminescence study is thermoluminescence (TL).Thermoluminescence is a common method used for the measurement of doses of ionizing radiations.The position, shape and intensities of the glow peaks are related to the properties of the trapping states accountable for the TL. The