

## Thermoluminescence Characteristic of Nanocrystalline BaSO<sub>4</sub> Doped with Europium

**Authors :** Kanika S. Raheja, A. Pandey, Shaila Bahl, Pratik Kumar, S. P. Lochab

**Abstract :** The subject of undertaking for this paper is the study of BaSO<sub>4</sub> nanophosphor doped with Europium in which mainly the concentration of the rare earth impurity Eu (0.05, 0.1, 0.2, 0.5, and 1 mol %) has been varied. A comparative study of the thermoluminescence(TL) properties of the given nanophosphor has also been done using a well-known standard dosimetry material i.e. TLD-100. Firstly, a number of samples were prepared successfully by the chemical co-precipitation method. The whole lot was then compared to a well established standard material (TLD-100) for its TL sensitivity property. BaSO<sub>4</sub>:Eu ( 0.2 mol%) showed the highest sensitivity out of the lot. It was also found that when compared to the standard TLD-100, BaSo4:Eu (0.2mol%) showed surprisingly high sensitivity for a large range of doses. The TL response curve for all prepared samples has also been studied over a wide range of doses i.e 10Gy to 2kGy for gamma radiation. Almost all the samples of BaSO<sub>4</sub>:Eu showed a remarkable linearity for a broad range of doses, which is a characteristic feature of a fine TL dosimeter. The graph remained linear even beyond 1kGy for gamma radiation. Thus, the given nanophosphor has been successfully optimised for the concentration of the dopant material to achieve its highest TL sensitivity. Further, the comparative study with the standard material revealed that the current optimised sample shows an astonishingly better TL sensitivity and a phenomenal linear response curve for an incredibly wide range of doses for gamma radiation (Co-60) as compared to the standard TLD-100, which makes the current optimised BaSo4:Eu quite promising as an efficient gamma radiation dosimeter. Lastly, the present phosphor has been optimised for its annealing temperature to acquire the best results while also studying its fading and reusability properties.

**Keywords :** gamma radiation, nanoparticles, radiation dosimetry, thermoluminescence

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