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**Nanoparticles of BaSO<sub>4</sub>:Eu for heavy-dose measurements**

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**Abstract**

Nanoparticles of BaSO<sub>4</sub>:Eu with grain size in the range 30-50 nm have been prepared by the chemical co-precipitation method and characterized by UV-visible spectrometry and X-ray diffraction (XRD). Shape and size of the prepared nanomaterials were observed by a scanning electron microscope (SEM). The optical energy band gaps of the micro- and nanocrystalline BaSO<sub>4</sub>:Eu were determined and are found to be  $3.39 \pm 0.0136$  and  $3.48 \pm 0.0139$  eV, respectively. The thermoluminescence (TL) glow curve of BaSO<sub>4</sub>:Eu nanoparticles has been studied and compared with that of the corresponding microcrystalline powder. It has been observed that the TL glow peak at 497 K, seen prominently in the microcrystalline sample, appeared as a small peak in nanocrystalline powder, while that observed as a shoulder in the former at 462 K dominates in the latter. The observed TL sensitivity of the prepared nanocrystalline powder is less than that of the microcrystalline sample at low doses, while it is more at higher doses. This nanophosphor exhibits a linear/sublinear TL response to  $\gamma$ -radiation over a very wide range of exposures (0.1 Gy to 7 KGy), which is much wider compared to that of the microcrystalline counterpart (0.1-10 Gy). This response over a large span of exposures makes the nanostructure form of BaSO<sub>4</sub>:Eu useful for its application to estimate low as well as high exposures of  $\gamma$ -rays. © 2008 Elsevier B.V. All rights reserved.

**Author Keywords**

Band gap; BaSO<sub>4</sub>:Eu; Nanoparticles; SEM; Thermoluminescence

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