

## Author's Accepted Manuscript

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PII: S0022-2313(17)31910-5  
DOI: <https://doi.org/10.1016/j.jlumin.2018.05.058>  
Reference: LUMIN15640

To appear in: *Journal of Luminescence*

Received date: 9 November 2017  
Revised date: 13 May 2018  
Accepted date: 24 May 2018

Cite this article as: Nandini Kumam, Laishram Priyobarta Singh, Sri Krishna Srivastava and Nongmeithem Rajmuhon Singh, Photoluminescence properties of  $\text{Eu}^{3+}$  doped  $\text{BaF}_2$  nanomaterials and  $\text{BaF}_2:3\text{Eu}/\text{Fe}_3\text{O}_4$  nanocomposite for hyperthermia application, *Journal of Luminescence*, <https://doi.org/10.1016/j.jlumin.2018.05.058>

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# Photoluminescence properties of $\text{Eu}^{3+}$ doped $\text{BaF}_2$ nanomaterials and $\text{BaF}_2:3\text{Eu}/\text{Fe}_3\text{O}_4$ nanocomposite for hyperthermia application

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## ABSTRACT

Cubical crystalline 3 at.%  $\text{Eu}^{3+}$  ion doped  $\text{BaF}_2$  nanomaterials have been successfully synthesised by ethylene glycol route. The cubical crystalline structure of  $\text{BaF}_2$  was confirmed by XRD analysis. FTIR study shows the significant capping of nanomaterials by ethylene glycol. Microscopy study indicates the change of shape of nanoparticles from spherical to rod at higher annealing temperature (900 °C). Photoluminescence studies give the characteristic emission of  $\text{Eu}^{3+}$  at 587 ( $^5\text{D}_0 \rightarrow ^7\text{F}_1$ , magnetic dipole transition) and 613 nm ( $^5\text{D}_0 \rightarrow ^7\text{F}_2$ , electric dipole transition). The decay time of as-prepared sample is longer than 900 °C annealed samples. The CIE chromaticity coordinates diagram shows the prepared nanomaterials can be used as orange-reddish emitter. The samples were dispersed in different organic solvents and observed that emission intensity increases with increase in chain length of the solvents. The prepared  $\text{Eu}_{0.03}\text{Ba}_{0.97}\text{F}_2/\text{Fe}_3\text{O}_4$  nanocomposites can achieve hyperthermia temperature (HT) at sort period. Nanocomposite generates more heat than pure  $\text{Fe}_3\text{O}_4$  nanoparticles.

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