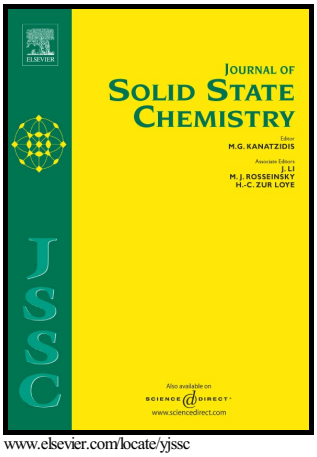


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# Structural, Photoluminescence and Radioluminescence Properties of $Eu^{3+}$ Doped $La_2Hf_2O_7$ Nanoparticles

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## Abstract

This study presents the structural, optical, and radioluminescent characterization of newly synthesized europium-doped lanthanum hafnate ($La_2Hf_2O_7$:xmol%$Eu^{3+}$, x = 0 to 35) nanoparticles (NPs) for use as phosphors and scintillation materials. Samples prepared through a combined co-precipitation and molten salt synthetic process were found to crystalize in the pyrochlore phase, a radiation tolerant structure related to the fluorite structure. These samples exhibit red luminescence under ultraviolet and X-ray excitation. Under these excitation wavelengths, the optical intensity and quantum yield of the $La_2Hf_2O_7$:xmol%$Eu^{3+}$ NPs depend on the $Eu^{3+}$ concentration and are maximized at 5%. It is proposed that there is a trade-off between the quenching due to defect states/cross-relaxation and a high dopant concentration. An optimal dopant concentration allows $La_2Hf_2O_7$:5mol%$Eu^{3+}$ NPs to show the best luminescent properties of all the samples.

[1] Both authors contributed equally to this work.