Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Europium-Doped Lanthanum Hafnate Nanoparticles: Structure, Photoluminescence, and Radioluminescence[1] KAREEM WAHID, MADHAB POKHREL, YUANBING MAO, University of Texas Rio Grande Valley — Due to their novel physical properties, nanostructured phosphors are of interest for radiation-based imaging and therapeutics. Herein, the structural and luminescent properties of europium-doped lanthanum hafnate ($La_2Hf_2O_7$:xmol%Eu^{3+}, x = 0 - 35) nanoparticles are investigated for use as scintillators. X-ray diffraction, Raman spectroscopy, and scanning electron microscopy confirm samples prepared through a combined co-precipitation and low-temperature molten salt synthetic process homogenously form spherical nanocrystals of $\sim$ 36 nm in the ordered pyrochlore phase. Ultraviolet and X-ray excitation of these samples induce strong red emissions in the 580 - 590 and 612 - 630 nm range corresponding to the $^5D_0 \rightarrow ^7F_1$ magnetic dipole and $^5D_0 \rightarrow ^7F_2$ electric dipole transitions of Eu^{3+}. Optical response and quantum yield are optimized at 5% Eu^{3+}; a proposed trade-off between quenching mechanisms (defect-states/cross-relaxation) and dopant concentration is discussed. Owing to their high density, large effective atomic number, and bright luminescence, these $La_2Hf_2O_7$:xmol%Eu^{3+} nanoparticles warrant further investigation for scintillator applications.

[1]The authors thank the support from the Defense Threat Reduction Agency of the U.S. Department of Defense (award #HDTRA1- 10-1-0114).

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Date submitted: 13 Apr 2017 Electronic form version 1.4