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LaF_3 and YAG:Ce^{3+} nanoparticle composites for radiation detection RYAN HALL, University of Texas at Arlington — Lanthanum fluoride (LaF_3) is an attractive crystal matrix, since it is non-hygroscopic and thermally stable. Previous work with bulk crystals has shown their suitability for scintillating detectors when doped with various rare-earth elements to tune emission properties. We explore the use of doped LaF_3 nanocrystals, less than 50 nm in diameter, using a combination of Ce^{3+}, Tb^{3+}, and Eu^{3+} dopants at concentrations from 1% to 10% by mole. These doped nanoparticles have the advantage of easy synthesis, and may be assembled through various methods depending on the desired properties. They also possess a large surface-to-volume ratio suitable for modification, such as ligands to control solubility in a variety of substances. For enhanced luminosity, we combine the LaF_3:Ce^{3+} with doped yttrium aluminum garnet ($Y_3Al_5O_{12}$:Ce^{3+}), prepared through a glycothermal method as nanoparticles of $\sim$30 nm diameter. We propose to use the energy transfer between the Ce dopant on each crystal to effect fast, high-yield response to incident radiation. Morphology of the LaF_3 and YAG products is examined, and we quantify response to a range of photon wavelengths, toward the goal of incorporating them into a radiation detection device.

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