Abstract Submitted
for the TSF17 Meeting of
The American Physical Society

Thermal Treatment Technique on Structural and Optical Properties of LaF3:Yb,Er[1] ALAN PEREZ, Department of Physics, University of Texas Rio Grande Valley, YUANBING MAO, Department of Chemistry, University of Texas Rio Grande Valley, MADHAB POKHREL, Department of Physics, University of Texas Rio Grande ValleyDepartment of Chemistry, University of Texas Rio Grande Valley — Due to their interesting surface and structural properties, recent years have seen the emergence of nanoparticle (NP) phosphors for use in numerous applications including defense and industry. Erbium (Er3+) and Ytterbium (Yb3+) doped Lanthanum fluoride (LaF3) NPs were synthesized via molten-salt synthesis (MSS) and systematically annealed to optimize crystal structure optical properties. Chemical analysis of the NPs includes X-ray diffraction (XRD) with Rietveld analysis, scanning electron microscopy (SEM), Raman, X-ray photoelectron spectroscopy (XPS), photoluminescence (PL) spectroscopy, and quantum yield (QY) measurements. The study found an increase in efficiency for near-infrared (NIR) and mid-infrared (MIR) emissions, as well as for the visible spectra in the NPs. The point of oxidation producing Lanthanum oxyfluoride (LaOF), which dampens NIR and MIR emissions due to multi-phonon relaxations (MPR), is also discussed. To further elaborate the technology in photovoltaics, scintillators, and biomedical applications, optimization of emissions by LaF3:Yb,Er will help understand the highly disputed energy mechanism of Erbium; and by extension, the optical mechanisms of other rare-earth (RE) phosphors.

[1]This research was supported by the Oak Ridge National Laboratory

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Date submitted: 21 Sep 2017 Electronic form version 1.4