

PHYSICS DEPARTMENT

COLLOQUIUM

“SYNTHESIS AND SPECTROSCOPIC CHARACTERIZATION OF RARE EARTH DOPED OPTICAL MATERIALS AND THEIR POTENTIAL APPLICATIONS”

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LHSB 1.104 (Brownsville)
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Abstract: Rare earth (RE) doped optical materials play a very important role in today's Photonics industry due to their numerous applications in lasers, scintillators, energy, optical memories, displays, security and biology applications. In order for these materials to be useful in many active and passive device applications, several criteria have to be considered in the proper selection of the host and dopants. In this presentation, an attempt will be made to do a thorough optical characterization of various Yb/Er doped upconversion (UC) based metal oxysulphides (M_2O_2S , $M=Y, Gd, La$) phosphors including their UC quantum yields (QYs). Furthermore, UC mechanisms will be explored, and explained based on the time resolved spectroscopic measurements, as well as other numerical simulations.

Furthermore, combined homogeneous precipitation and molten salt synthesis of downconversion (Stokes emission) based $A_2B_2O_7:5\%Eu^{3+}$ ($A=RE = Y, La, Pr, Gd, Er, \text{ and } Lu, B = Hf \text{ and } Zr$) oxide nanoparticles (NPs) will be discussed. An effort will be made to explain the effects of the A-site RE^{3+} cation and calcination on the crystal structure and photoluminescence properties of $A_2B_2O_7:5\%Eu^{3+}$ NPs. Detailed photoluminescence (PL) studies, including quantum yield and decay properties of each sample, before and after calcination, will be discussed and correlated with their compositions and crystal structures. Finally, disordered-ordered transition observed in $A_2B_2O_7:5\%Eu^{3+}$ ($RE = Y, La, Pr, Gd, Er, \text{ and } Lu, B = Hf, Zr$) under calcination and ordered-disordered transitions observed in $La_2Hf_2O_7:5\%Eu^{3+}$ under radiation exposure will be discussed.