National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Red/Orange-Red Emitting Phosphors For Solid State Lightings: Structure-Compositions-Property-Correlations.
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Venue	: Hybrid mode: Chemistry department seminar room online link: https://meet.google.com/euq-tdpc-uzy
Date and Time	: 02 Apr 2025 (10:30 AM)
Abstract	: Highly efficient narrow band red-emitting phosphors based on oxides remain a significant challenge for white LED applications. The development of narrow band red emitters has drawn a lot of attention in the last decade as a way to imitate the white spectrum of white LEDs with the sensitivity curve of human eye, improving color rendition and visual energy efficiency. The combination of a broad band yellow/green phosphor with narrow band red phosphor and blue InGaN LED or near UV LED is known to produce warm white LEDs for general lighting with improved CRI and/o luminous efficacy of radiation (LER). Most current red phosphors, often based on sulfides or nitrides, face issues related to stability and synthesis conditions. This thesis focuses on narrow band red emitting phosphors with scheelite structures [$Na_2Y_4(WO_4)_7$ $Na_2La_4(WO_4)_7$ $Na_5M(WO_4)_4$, where M = Y and Gd $Li_2La_4(MoO_4)_7$]. The synthesized phosphors were characterized using different spectroscopic techniques. Intense red light is exhibited by all the synthesized Eu^{3+} activated phosphor due to the dominance of ED ($^5D_0$ &rarr $^7F_2$ at 616 nm) transition in the emission spectra. All the synthesized red phosphors were studied for w-LED application. At the same time, Sm^{3+}/Eu^{3+} co-doped red/deep-red emitting phosphors were also synthesized and investigated in detail to examine their potential use as plant growth LED owing to the complete coverage of the absorption spectra of photopigment phytochrome P_R. Additionally, Eu(III) molecular complexes with phenanthro-imidazole-based ancillary ligands were synthesized for Eu^{3+} ternary complexes using dibenzoylmethane (DBM) and thenoyltrifluoroacetone (TTA) as anionic ligands. The studied Eu(III) complexes were used for the fabrication of w-LED and vapoluminescence sensor.