



Contribution ID: 78

Type: Oral

Enhanced Blue Luminescence in $\text{Y}_2\text{O}_3:\text{Ce}^{3+}$, Eu^{2+} Phosphor Mediated by $\text{Ce}^{3+} \rightarrow \text{Eu}^{2+}$ Energy Transfer

Saturday 1 November 2025 16:00 (15 minutes)

Blue-emitting phosphors hold significant potential for applications in solid-state lighting. We synthesised Y_2O_3 phosphors co-doped with 1 mol% Ce^{3+} and varying concentrations (1, 2, 3, and 4 mol%) of Eu^{2+} using the solution combustion method. Structural, compositional, optical absorption, and emission properties were investigated. X-ray diffraction analysis confirmed the formation of a cubic phase with the Ia-3 (206) space group, and the incorporation of dopants did not alter the host crystal structure. The Ce^{3+} doped sample exhibited a strong absorption band around 206 nm, which was observed to red-shift upon Eu^{2+} co-doping. Under 300 nm UV excitation, the Ce^{3+} - Eu^{2+} co-doped samples displayed prominent blue emission, originating from the $5d \rightarrow 4f$ transitions of Ce^{3+} ($2F7/2$, $2F5/2$) and the allowed $4f^65d^1 \rightarrow 4f^7$ transition of Eu^{2+} . Photoluminescence spectra, excitation profiles, decay dynamics, and energy transfer efficiency analyses confirmed an efficient $\text{Ce}^{3+} \rightarrow \text{Eu}^{2+}$ energy transfer mechanism. The critical distance between Ce^{3+} and Eu^{2+} ions was calculated to be 4.56 Å, indicating exchange interaction as the dominant energy transfer pathway. These findings demonstrate that $\text{Y}_2\text{O}_3:\text{Ce}^{3+}$, Eu^{2+} phosphors are promising candidates for use as blue light-emitting components in solid-state white lighting applications.

Keywords: $\text{Y}_2\text{O}_3:\text{Ce}$, Eu nanophosphor; Optical band gap; Photoluminescence; Energy transfer; Luminescence lifetime; Quenching

Author: DUTTA, Manashree (Cotton University)

Presenter: DUTTA, Manashree (Cotton University)

Session Classification: Oral Presentations

Track Classification: Track 03: Material Science & Nano-science, Quantum Thermodynamics & Statistical Physics