Solid-State Synthesis Approach and Optical study of Red Emitting Phosphors $Li_3BaSrxCa_{1-x}Eu_{2.7}Gd_{0.3}(MoO_4)_8$ for White LEDs

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Abstract : Solid-state synthesis methods were used for the synthesis of pure red emissive Li¬3BaSrxCa(1-x)Eu2.7Gd0.3(MoO4)8 (x = 0.0 to 1.0) phosphors, XRD, SEM, and FTIR spectra were used to characterize the materials, and their optical properties were thoroughly investigated. PL studies were examined at different excitations 230 nm, 275nm, 465nm, and 395 nm. All the spectra show similar emissions with the highest transition at 616 nm due to ED transition. The given phosphor Li¬3BaSr0.25Ca0.75Eu2.7Gd0.3(MoO4)8 shows the highest intensity and is thus chosen for the temperature-dependent and Quantum yield study. According to the PL investigation, the phosphor-containing Eu3+ emits red light due to the (5D0 7F2) transition. The excitation analysis shows that all of the Eu3+ activated phosphors exhibited broad absorption due to the charge transfer band, O2-Mo6+, O2-Eu3+ transition, as well as narrow absorption bands related to the Eu3+ ion's 4f-4f electronic transition. Excitation spectra show Charge transfer band at 275 nm shows the highest intensity. The primary band in the spectra refers to Eu3+ ions occupying the lattice's non-centrosymmetric location. All of the compositions are monoclinic crystal structures with space group C2/c and match with reference powder patterns. The thermal stability of the 3BaSr0.25Ca0.75Eu2.7Gd0.3(MoO4)8 phosphor was investigated at (300 k- 500 K) as well as at low temperature from (20 K to 275 K) to be utilized for red and white LED fabrication. The Decay Lifetime of all the phosphor was measured. The best phosphor was used for White and Red LED fabrication.

Keywords : PL, phosphor, quantum yield, white LED
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