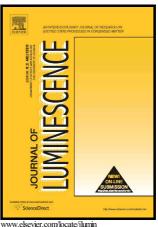
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Zinc phosphate glasses activated with $Dy^{3+}/Eu^{3+}/Sm^{3+}$ and $Tb^{3+}/Eu^{3+}/Sm^{3+}$ for reddishorange and yellowish white phosphor applications

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ABSTRACT

Spectroscopic evaluations of Dv³⁺/Eu³⁺/Sm³⁺ and Tb³⁺/Eu³⁺/Sm³⁺ doped zinc phosphate glasses, based on excitation and emission spectra, and emission decay measurements, are particularly focused on potential white light-emitting diodes applications. All the excitation wavelengths located in the 337-382 nm range, match with the emissions of AlGaN, GaN and InGaN LEDs. The Dy³⁺/Eu³⁺/Sm³⁺ doped zinc phosphate glass excited at 347 nm displays yellowish white tonality according with the x = 0.396 and y = 0.408 CIE1931 chromaticity coordinates and correlated color temperature (CCT) value of 3837 K, whereas under 362, 374 and 382 nm excitations, it displays reddish-orange tonality with CIE1931 chromaticity coordinates (and CCT values): x = 0.503 and y = 0.398 (2075 K), x = 0.570and y = 0.388 (1640 K), and x = 0.527 and y = 0.386 (1804 K), respectively, with color purities higher than 72%. The Dy³⁺ and Sm³⁺ emission decay analysis suggests that nonradiative energy transfer processes from Dy³⁺ to Eu³⁺ and/or Sm³⁺ and Sm³⁺ to Eu³⁺ take place with efficiencies of 0.09 ± 0.04 and 0.15 ± 0.04 , respectively. The Dy³⁺ and Sm³⁺ emission decay fitting by the Inokuti-Hirayama model, indicates that electric dipolequadrupole and quadrupole-quadrupole interactions might respectively mediate the energy transfer processes inside the Dy³⁺-Sm³⁺-Eu³⁺ clusters. The Tb³⁺/Eu³⁺/Sm³⁺ doped zinc phosphate glasses only exhibits reddish-orange emission tonality with CIE1931 chromaticity coordinates and (CCT values): x = 0.510 and y = 0.425 (2210 K), x = 0.549

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