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Synthesis and Luminescence Investigation of Eu³⁺ Doped Ca₂KZn₂V₃O₁₂ Phosphors: A Potential Material for WLEDs Applications(Article)

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Abstract

A series of white light emitting Ca₂KZn_{2-x}V₃O₁₂:xEu³⁺ (x = 0.1, 0.2, 0.3, 0.4 and 0.5) phosphor samples were successfully synthesized by the traditional solid-state reaction method. The powder X-ray diffraction (XRD) patterns of the as-prepared sample reveal the high degree of crystallinity of the cubical structure with Ia₃⁻d space group and without any other phase formation. Fourier transform infrared (FTIR) spectra confirmed the occurrence of characteristic vibrational bands of garnet vanadate. The optical diffuse reflectance spectra consisting of broad band absorption in the ultraviolet (UV) region and the sharp absorption in the visible region were ascribing to the charge transfer between ligand-metal in the VO₄ tetrahedral group and Eu³⁺ ions. Under the UV and near-UV excitation wavelengths, the broad band emission and the sharp emission were ascribing to the host material charge transfer of the VO₄ tetrahedral group and f-f transitions of the rare-earth Eu³⁺ ions respectively. Ultimately, through the doping concentration optimization, a high Color Rendering Index (CRI) and excellent Correlated Color Temperature (CCT) were achieved with cool white emission. Therefore, the contribution of Ca₂KZn_{1.8}Eu_{0.2}V₃O₁₂ phosphor was significant to phosphor-converted white light emitting device (WLEDs) excited with near ultraviolet. © 2020, Springer Science+Business Media, LLC, part of Springer Nature.

Author keywords

f-f transition Phosphor Photoluminescence Solid state reaction WLEDs

Indexed keywords

Engineering controlled terms:

Calcium compounds Charge transfer Crystallinity Fourier transform infrared spectroscopy
Light Light emission Phosphors Rare earths Solid state reactions
Uranium metallography

Engineering uncontrolled terms

Correlated color temperature Degree of crystallinity Diffuse reflectance spectrum
Fourier transform infrared High color rendering index Powder X ray diffraction
Solid state reaction method White light emitting device

Engineering main heading:

Zinc compounds

Cited by 15 documents

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