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Synthesis and Luminescence Investigation of Eu^{3+} Doped $Ca_2KZn_2V_3O_{12}$ Phosphors: A Potential Material for WLEDs Applications(Article)

Jeyakumaran, T., Bharathi, N.V., Sriramachandran, P., Shanmugavel, R., Ramaswamy, S.

[a]PG and Research Department of Physics, N.M.S.S.V.N. College, Madurai, Tamilnadu 625 019, India
[b]Physics Research Centre, V.H.N.S.N. College, Virudhunagar, Tamilnadu 626 001, India

Abstract

A series of white light emitting $Ca_2KZn_{2-x}V_3O_{12}:xEu^{3+}$ (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 VO_4 tetrahedral group and Eu^{3+} 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 VO_4 tetrahedral group and f-f transitions of the rare-earth Eu^{3+} 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 $Ca_2KZn_{1.8}Eu_{0.2}V_3O_{12}$ phosphor was significant to phosphor-converted white light emitting device (WLEDs) excited with near ultraviolet.

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

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Ramaswamy, S.; PG and Research Department of Physics, N.M.S.S.V.N. College, Madurai, Tamilnadu, India;