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Novel zincate phosphors: A new red-emitting phosphors for LED applications

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Abstract content (Max 300 words)
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A series of lanthanum calcium zincate ($\text{La}_{2-x}\text{Ca}_x\text{ZnO}_5$) phosphors doped with Eu^{3+} have been synthesized by the solid state reaction method at different temperatures (700-1300 °C). The reaction temperatures had a significant effect on the surface morphology and luminescent properties of the resultant phosphors. Powder diffraction results showed the formation of a single-phase orthorhombic structure and that the dopant ions do not affect the crystal structure. The scanning and transmission electron microscopic images revealed the irregular morphology of the prepared phosphors consisting out of μm sized diameter particles. The Eu^{3+} doped phosphors illuminated with ultraviolet light showed the characteristic red luminescence corresponding to the ${}^5\text{D}_0 \rightarrow {}^7\text{F}_J$ transitions of Eu^{3+} . The phenomenon of concentration quenching is explained on the basis of ion-ion interaction, electron-phonon coupling and defect to ion energy transfer. Furthermore, the spectral characteristics and the Eu-O ligand behaviour were determined using the Judd-Ofelt theory from the spectra. The CIE parameters were calculated using the spectral energy distribution functions and McCamy's empirical formula. Photometric characterization indicated the suitability of this phosphor for pure red emission in light emitting diode applications.

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