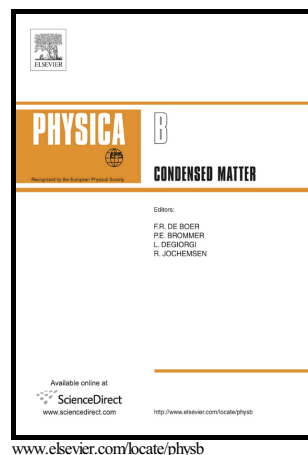


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Combustion synthesis and characterization of blue long lasting phosphor $\text{CaAl}_2\text{O}_4: \text{Eu}^{2+}, \text{Dy}^{3+}$ and its novel application in latent fingerprint and Lip mark detection

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Abstract

This work investigates the structural, optical and photometric characterization of a $\text{Eu}^{2+}/\text{Dy}^{3+}$ doped calcium aluminates phosphor ($\text{CaAl}_2\text{O}_4: \text{Eu}^{2+}/\text{Dy}^{3+}$) for finger and lip print detections. Synthesis of $\text{CaAl}_2\text{O}_4: \text{Eu}^{2+}/\text{Dy}^{3+}$ (CAED) phosphors were carried out via a combustion synthesis method with urea as a fuel. $\text{Eu}^{2+}/\text{Dy}^{3+}$ doped CaAl_2O_4 phosphors have been studied with X-ray diffraction (XRD, Energy Dispersive X-Ray Spectroscopy Selected Area Diffraction (SAED) and High resolution Transmission Electron Microscope (HR-TEM). The XRD pattern shows that the synthesized $\text{Eu}^{2+}/\text{Dy}^{3+}$ doped CaAl_2O_4 phosphor have a single monoclinic structure and show that the addition of the dopant/co-dopants didn't change the crystal structure. The formation of monoclinic phase was confirmed by the selected area diffraction pattern. The TEM micrograph displays the morphology of the synthesized $\text{Eu}^{2+}/\text{Dy}^{3+}$ doped CaAl_2O_4 phosphors as spherical particles with an average particle size of 33 nm. The optical band gap was calculated using the diffuse reflectance for the synthesized nanophosphor powders. The photoluminescence emission spectra was recorded for the synthesized powder, with an excitation wavelength of 326 nm and the major bands was recorded at 447 nm corresponding to the blue color and two minor bands were recorded at 577 nm and 616 nm. To the best of our knowledge, this work is the first to show the use of $\text{CaAl}_2\text{O}_4: \text{Eu}^{2+}/\text{Dy}^{3+}$ nanophosphor in developing latent fingerprint and lip print effectively.

Keywords

Nanophosphor, Photoluminescence, fingerprint, lip print, forensic, combustion synthesis

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