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Facile combustion based engineering of novel white light emitting $Zn_2TiO_4:Dy^{3+}$ nanophosphors for display and forensic applications

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Abstract

Nanomaterials find a wide range of applications in surface based nanoscience and technology. To pass high backward encumbrance, low sensitivity, complicated setup and poor universality in traditional methods for the enhancement of latent fingerprints, display applications we explored the superstructures of dysprosium (Dy^{3+}) doped Zn_2TiO_4 via a facile solution combustion route. This method offers new potentials in surface-based science comprising display, latent fingerprint, and luminescent ink for anticounterfeiting applications. The characteristic emissions of intra-4f shell Dy^{3+} cations in blue, yellow and red regions corresponding to $^4F_{9/2}$ to $^6H_{15/2}$, $^6H_{13/2,}$ and $^6H_{11/2}$ transitions respectively, showed white emission, and Judd-Ofelt theory was used to estimate photometric parameters. Concentration quenching phenomenon is discussed based on possible interactions. Our study reveals a new prospect of using optimized $Zn_2TiO_4:Dy^{3+}$ nanophosphors for research in display, fingerprint detection, cheiloscopy, anti-counterfeiting technology, ceramic pigment and forensic applications.

Keywords: $Zn_2TiO_4:Dy^{3+}$; Nanophosphor; CIE n CCT; Judd-Ofelt; Latent Finger Print;

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