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# Primary-Color Emitting Photon Energy Storage Nanophosphors for Developing High Contrast Latent Fingerprints

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**Abstract :** Commercially available long afterglow /persistent phosphors are proprietary materials and hence the exact composition and phase responsible for their luminescent characteristics such as initial intensity and afterglow luminescence time are not known. Further to generate various emission colors, commercially available persistence phosphors are physically blended with fluorescent organic dyes such as rodhamine, kiton and methylene blue etc. Blending phosphors with organic dyes results into complete color coverage in visible spectra, however with time, such phosphors undergo thermal and photo-bleaching. This results in the loss of their true emission color. Hence, the current work is dedicated studies on inorganic based thermally and chemically stable primary color emitting nanophosphors namely SrAl2O4:Eu2+, Dy3+, (CaZn)TiO3:Pr3+, and Sr2MgSi2O7:Eu2+, Dy3+. SrAl2O4: Eu2+, Dy3+ phosphor exhibits a strong excitation in UV and visible region (280-470 nm) with a broad emission peak centered at 514 nm is the characteristic emission of parity allowed 4f65d1→4f7 transitions of Eu2+ (8S7/2→2D5/2). Sunlight excitable Sr2MgSi2O7:Eu2+,Dy3+ nanophosphors emits blue color (464 nm) with Commercial international de I'Eclairage (CIE) coordinates to be (0.15, 0.13) with a color purity of 74 % with afterglow time of > 5 hours for dark adapted human eyes. (CaZn)TiO3:Pr3+ phosphor system possess high color purity (98%) which emits intense, stable and narrow red emission at 612 nm due intra 4f transitions (1D2 → 3H4) with afterglow time of 0.5 hour. Unusual property of persistence luminescence of these nanophoshphors supersedes background effects without losing sensitive information these nanophosphors offer several advantages of visible light excitation, negligible substrate interference, high contrast bifurcation of ridge pattern, non-toxic nature revealing finger ridge details of the fingerprints. Both level 1 and level 2 features from a fingerprint can be studied which are useful for used classification, indexing, comparison and personal identification. facile methodology to extract high contrast fingerprints on non-porous and porous substrates using a chemically inert, visible light excitable, and nanosized phosphorescent label in the dark has been presented. The chemistry of non-covalent physisorption interaction between the long afterglow phosphor powder and sweat residue in fingerprints has been discussed in detail. Real-time fingerprint development on porous and non-porous substrates has also been performed. To conclude, apart from conventional dark vision applications, as prepared primary color emitting afterglow phosphors are potentional candidate for developing high contrast latent fingerprints.

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