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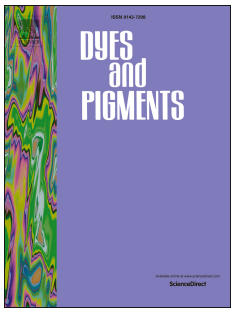

Stable and brightly luminescent all-inorganic cesium lead halide perovskite quantum dots coated with mesoporous silica for warm WLED

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Abstract: All-inorganic $CsPbX_3$ (X=Cl, Br, I) perovskite quantum dots (QDs) have been investigated owing to their novel optical properties, such as the high photoluminescence (PL) quantum yields (QYs), narrow line-with and tunable wavelength. However, the usual $CsPbX_3$ QDs suffer from the instability and the anion-exchange reaction, which hinder their applications. In this work, we present an efficient approach towards stable solid-state QDs composites by coating the $CsPbX_3$ QDs with the mesoporous silica matrixes (QDs/silica). The as-prepared QDs/silica composite not only maintain the QDs remarkable optical properties, but also improve their stability. Meanwhile, the approach also prevents the anion-exchange reaction between perovskite QDs of various halid compositions mixed together in the solid-state. Therefore, these excellent properties enable the QD/silica composite to improve the color rending index (CRI) and the correlated color temperature (CCT) of the traditional phosphor-converted white light-emitting diodes (WLEDs). Herein, for the first time, the red QD/silica composite was used as red phosphor and stacked on the Ce^{3+}:YAG phosphor-in-glass (Ce-PiG) via screen-printing technology (Ce-PiG&R-QDs/silica). Subsequently, warm WLEDs were constructed by blending the Ce-PiG&R-QDs/silica materials with the InGaN blue chips. More importantly, the constructed WLEDs generate a warm white with an optimal luminous efficacy (LE) of 56 lm/W, a high CRI of 92, R9 of 90 and a low CCT of 4718 K. These results indicate that the QD/silica composites

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