Origin of spectral shifts induced by the post-synthetic room-temperature doping of $CsPbBr_3$ nanocrystals with aluminum

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Abstract

$CsPbX_3$ (X=Cl, Br, I) NCs emission peak can be tuned over a wide range by changing composition, but so far, $CsPbBr_3$ excels in both emission stability and photoluminescence quantum yield. Therefore, efforts have been made to tune the optical properties of $CsPbBr_3$ NCs, with B-site doping being one of the viable strategies. With trivalent dopants (Bi^{3+}, Ce^{3+}), the photoluminescence can be modulated by the introduction of trap states, but the emission peak remains unchanged. However, with the use of divalent dopants (Cd^{2+}, Sn^{2+}), the green emission peak shows a hypsochromic shift up to 60 nm. In this work, we doped $CsPbBr_3$ NCs with Al^{3+} using a quick and facile post-synthetic doping procedure at room temperature. The emission wavelength can be tuned from 509 to 482 nm, and the origin of this doping effect was also investigated.