Monodisperse Cesium lead bromide perovskite nanocrystals (NCs) $CsPbBr_3$ with High brightness and stable green emission for application in light emitters devices

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Lead bromide perovskite nanocrystals (NCs) $APbBr_3$ in where A can be Cs^+, FA^+: $CH(NH_2)_2^+$, MA^+: $CH_3NH_3^+$ are very promising high-color purity light emitters due to their pure green emission and excellent optical properties. In this contribution, the Cesium lead bromide perovskite $CsPbBr_3$ nanocrystals have been synthesized by the hot injection method according to Imran et al synthesis approach [1], in which the benzoyl bromide was used as halide precursor. The colloidal $CsPbBr_3$ NCs were synthesized by dissolving and degassing the cesium carbonate and lead acetate in octadecene, oleylamine, and oleic acid as surfactants at 130°C in a three-neck flask. After degassing, the temperature was raised up to 170 °C under Ar flux, following by rapidly injected the benzoyl bromide precursor into the reaction flask, provoking immediately the nucleation and growth of the CsPbBr3 NCs. The resultant 12.31 nm of highly monodisperse $CsPbBr_3$ nanocubes exhibit excellent optical properties, with high-phase purity, strong green photoluminescence emission efficiency at 502 nm with narrow full width at half-maximum 12 nm, along with PLQY as high as 92%, and average lifetimes of 14.4 ns. Preliminary studies with magnetic circularly polarized luminescence were carried out to gather insight into the electronic structure of the systems. An asymmetry between right and left circularly polarized light was found at the emission peak at room temperature, suggesting a magnetic field-induced rearrangement of the population of the ground or excited states. This synthesis of $CsPbBr_3$ perovskite NCs presents important optical properties, which are among the best-promoting characteristics for a pure green light-emitting device according to the updated recommendation 2020 (Rec. 2020) standard [2].

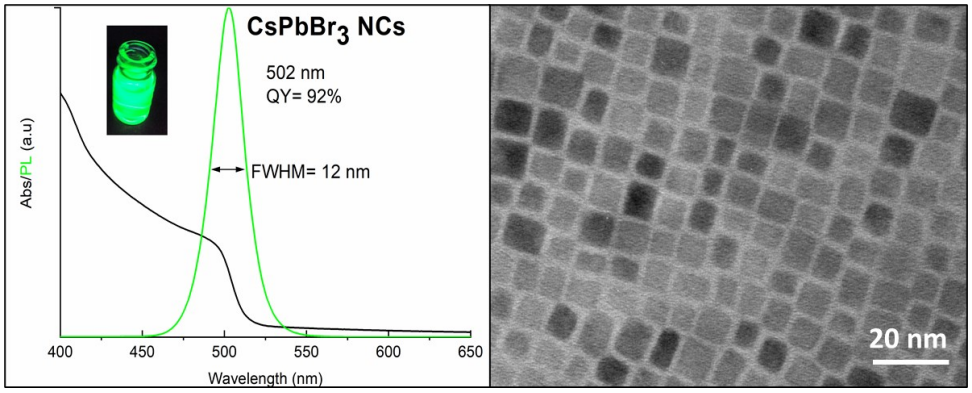

Figure 1. absorption and PL spectra of $CsPbBr_3$, inside photograph of colloidal $CsPbBr_3$ NCs in toluene solution under a UV lamp (λ=365 nm), and TEM images of 12.31 nm $CsPbBr_3$ NCs.

[1] Imran, Muhammad, et al. Journal of the American Chemical Society 140.7 (2018): 2656-2664.

[2] Zhu, Ruidong, et al. Optics express 23.18 (2015): 23680-23693.

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