Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting information

Solution-Grown Millimeter-Scale Mn-Doped $CsPbBr_3/Cs_4PbBr_6$ Crystals with Enhanced Photoluminescence and Stability for Light-Emitting Application

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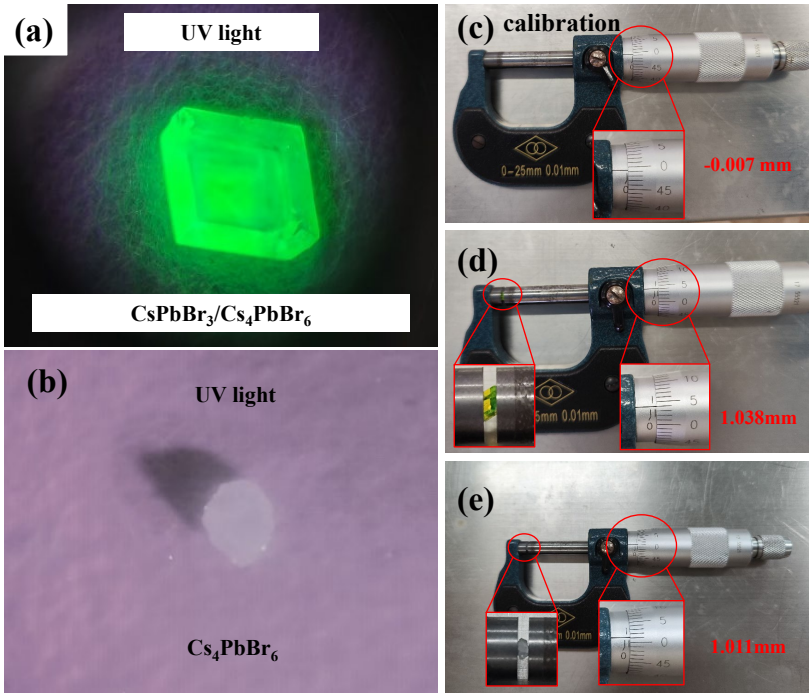

Fig. S1 (a) Photograph of $CsPbBr_3/Cs_4PbBr_6$ crystals under UV light. (λ_{ex} = 395 nm) (b) Photograph of pure Cs_4PbBr_6 single crystals under UV light (λ_{ex} = 395 nm). (c) The screw micrometer is zeroed, and the zero error is determined to be -0.007 mm. (d) Thickness measurement picture of $CsPbBr_3/Cs_4PbBr_6$ crystal. (e) Thickness measurement picture of Cs_4PbBr_6 single crystal.

Just prepared **After 1 year**

Fig. S2 Photographs of $CsPbBr_3/Cs_4PbBr_6$ crystals ground into powder under UV light (λ_{ex} = 395 nm).

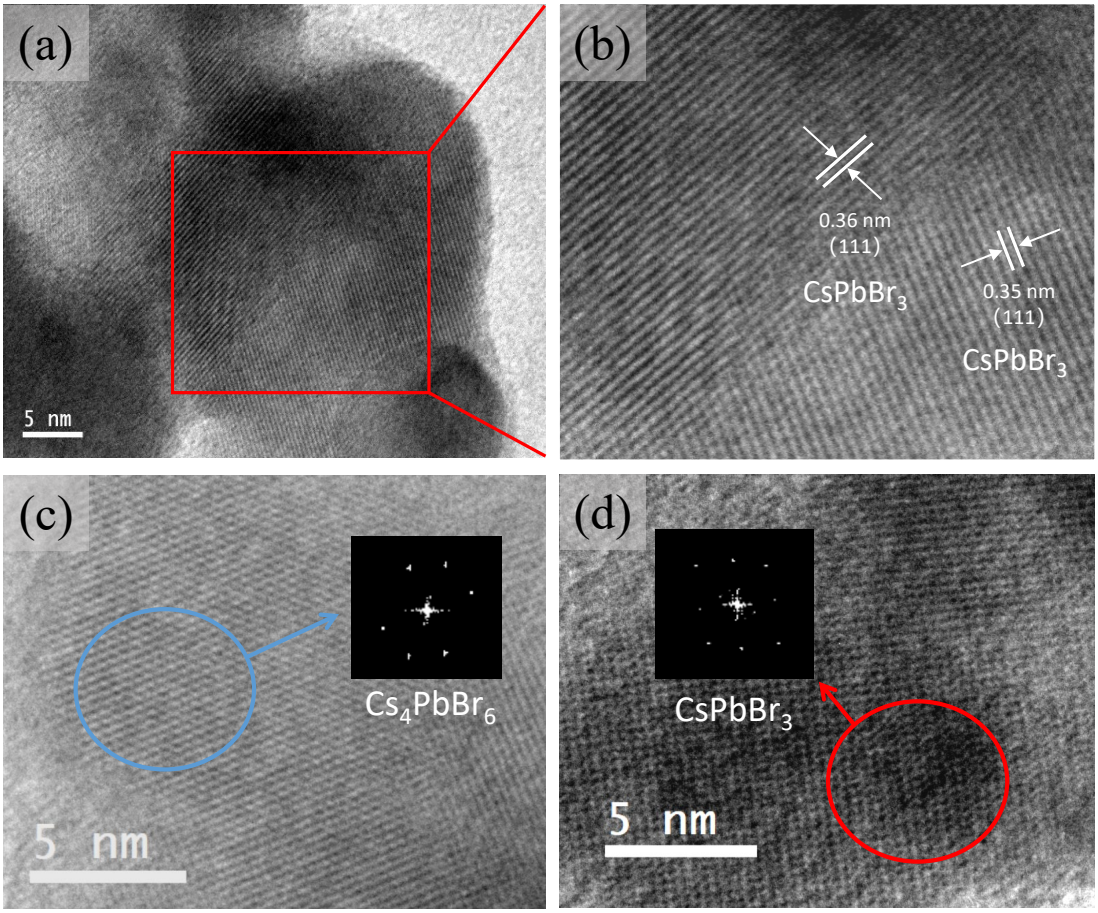

Fig. S3 (a) Typical TEM image of a particle processed from as-grown $CsPbBr_3/Cs_4PbBr_6$ crystals (b) The corresponding enlarged TEM image of panel a plotted with lattice spacing. (c) HRTEM image of the same particle with panel a processed from $CsPbBr_3/Cs_4PbBr_6$ crystals. The inset is the corresponding FFT pattern. (d) Another HRTEM image of the same particle with panel a processed from $CsPbBr_3/Cs_4PbBr_6$ crystals, and the inset is the corresponding FFT pattern.

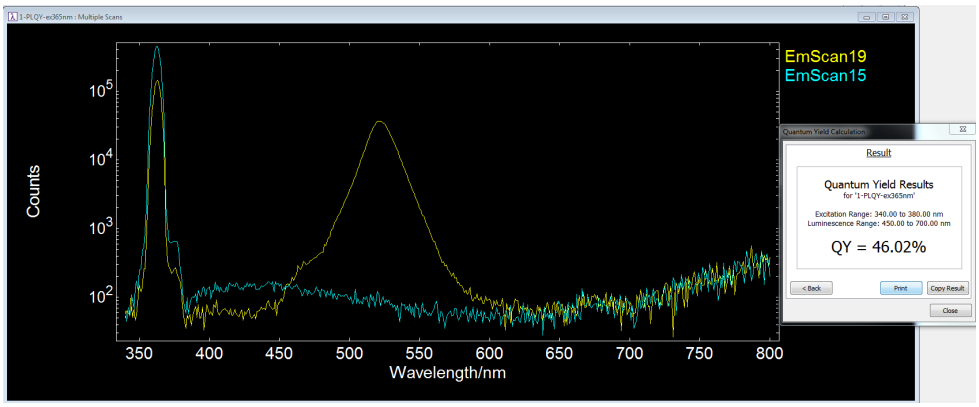

Fig. S4 PLQY image of just prepared $CsPbBr_3/Cs_4PbBr_6$ crystals.

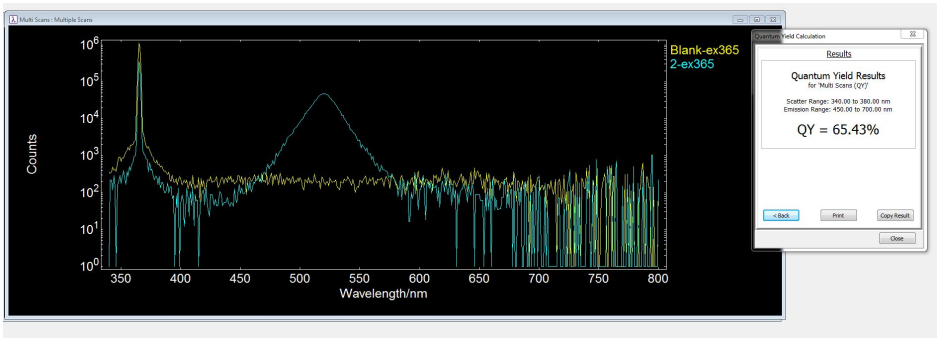

Fig. S5 PLQY image of just prepared Mn-doped $CsPbBr_3/Cs_4PbBr_6$ crystals.

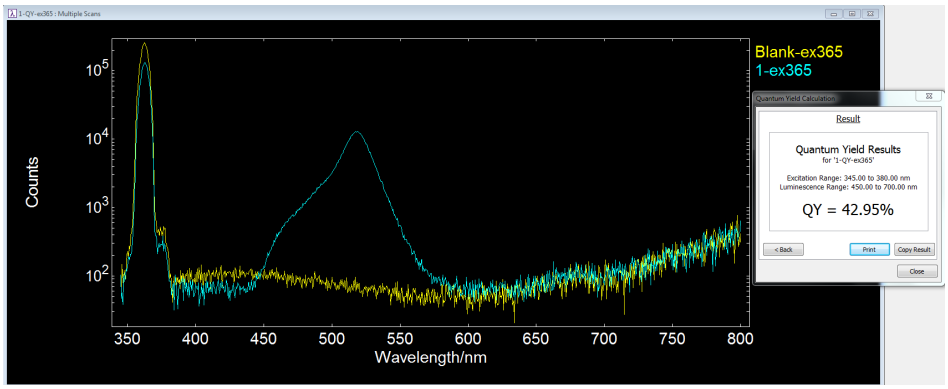

Fig. S6 PLQY image of $CsPbBr_3/Cs_4PbBr_6$ crystals directly placed under an air atmosphere after three months.

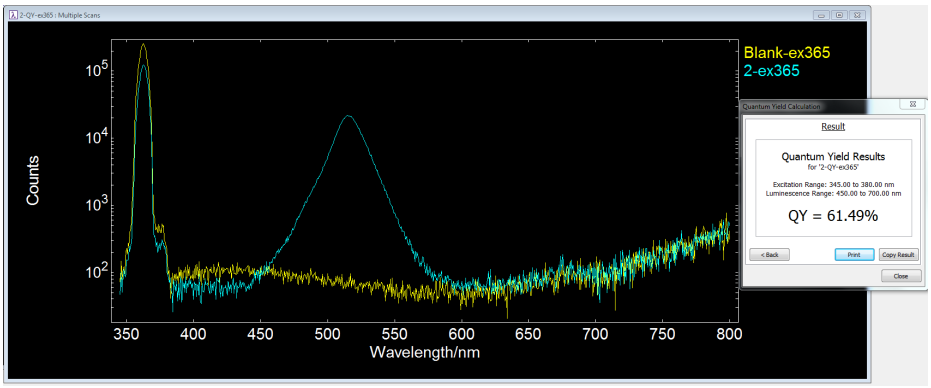

Fig. S7 PLQY image of Mn-doped $CsPbBr_3/Cs_4PbBr_6$ crystals stored directly placed under an air atmosphere for three months.

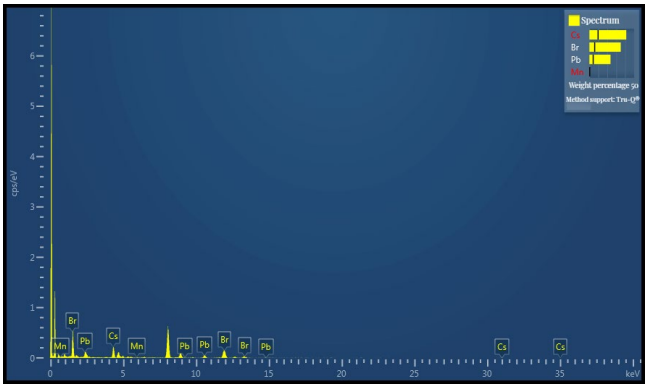

Fig. S8 The EDS spectra of Mn-doped $CsPbBr_3/Cs_4PbBr_6$ crystals.

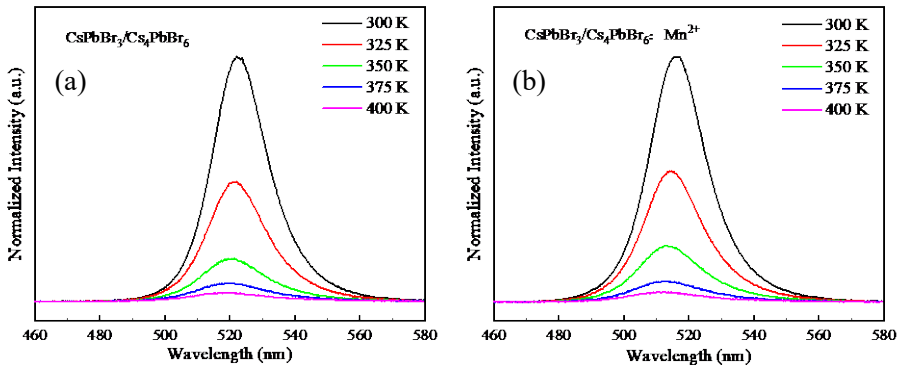

Fig. S9 (a) The temperature-dependent PL spectra of $CsPbBr_3/Cs_4PbBr_6$ crystals. (b) The temperature-dependent PL spectra of Mn^{2+} doped $CsPbBr_3/Cs_4PbBr_6$ crystals.

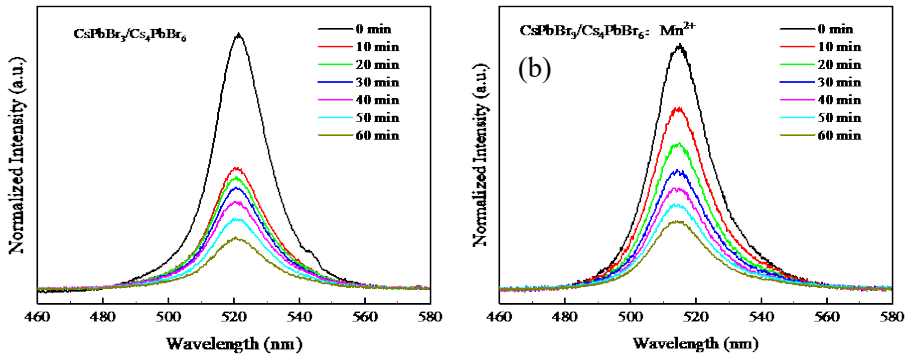

Fig. S10 (a) PL spectra of $CsPbBr_3/Cs_4PbBr_6$ crystals under a humid condition with humidity of 70%. (b) PL spectra of Mn^{2+} doped $CsPbBr_3/Cs_4PbBr_6$ crystals under a humid condition with humidity of 70%.

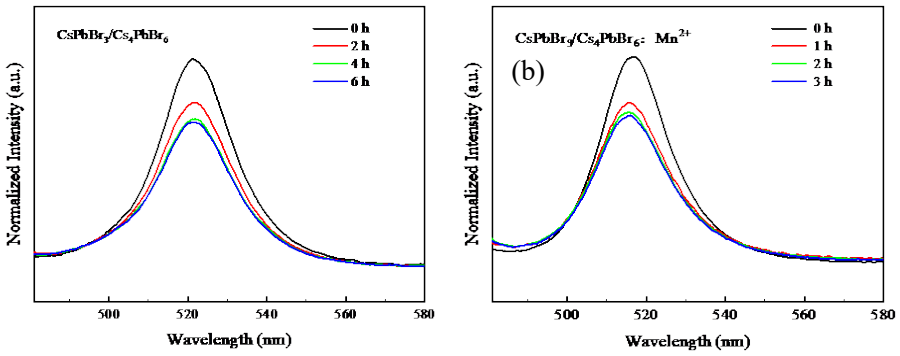

Fig. S11 (a) The PL spectra of $CsPbBr_3/Cs_4PbBr_6$ crystals under 455 nm laser irradiation with a power density of 5 W/cm^2. (b) The PL spectra of Mn^{2+} doped $CsPbBr_3/Cs_4PbBr_6$ crystals under 455 nm laser irradiation with a power density of 5 W/cm^2.

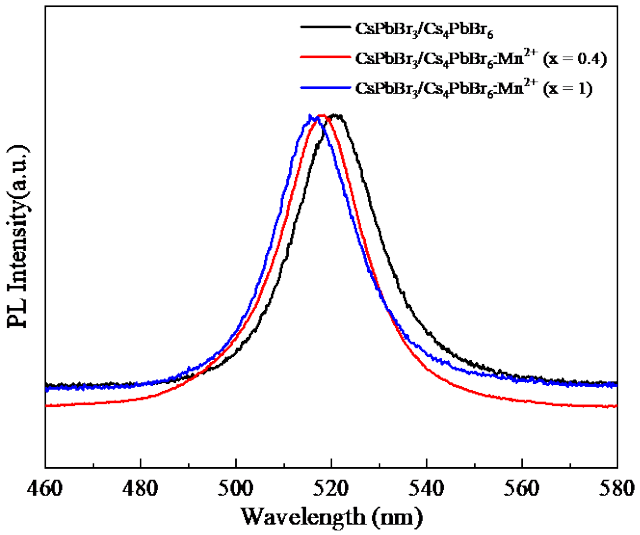

Fig. S12 Normalized PL spectra of Mn-doped and undoped $CsPbBr_3/Cs_4PbBr_6$ crystals with different content of Mn^{2+} ions. x is expressed as the amount of substance of $MnBr_2$ in the $CsPbBr_3/Cs_4PbBr_6$ crystal doped with Mn^{2+} ions, x = 0.4 mmol and x = 1 mmol, respectively.

Table S1 Summary of the EDS analysis of Mn-doped $CsPbBr_3/Cs_4PbBr_6$ crystals.

Element	Wt%	Wt% Sigma
Mn	0.27	0.40
Br	35.00	5.90
Cs	41.19	9.64
Pb	23.54	4.22