Supporting information

Stable $CsPbBr_3$ Perovskite Quantum Dots with high fluorescence quantum yields

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$$Cs_2CO_3 + 2HOOCR \rightarrow 2Cs(OOCR) + H_2O\uparrow + CO_2\uparrow \quad \text{(S1)}$$

$$PbBr_2 + xHOOCR + xRNH_2 \rightarrow xRNH_3Br + PbBr_{2-x}(OOCR)_x \quad x=1 \text{or } 2 \quad \text{(S2)}$$

$$2Cs(OOCR) + 3PbBr_2 \rightarrow Pb(OOCR)_2 + 2CsPbBr_3 \quad OOCR=\text{oleate} \quad \text{(S3)}$$

Equation (S1), (S2) and (S3) Three main reactions in this synthesis system.

$$\Phi_X = \Phi_{ST}\left(\frac{Grad_X}{Grad_{ST}}\right)\left(\frac{\eta_X^2}{\eta_{ST}^2}\right) \quad \text{S4}$$

Equation (S4) Calculation formula of the relative PLQY.[S1] (Φ is QY, the subscripts ST and X denote standard and test respectively, Grad is the gradient from the plot of integrated fluorescence intensity *vs* absorbance and η the refractive index of the solvent.)

$$A(t) = A_1 \exp\left(-\frac{t}{\tau_1}\right) + A_2 \exp\left(-\frac{t}{\tau_2}\right) + A_3 \exp\left(-\frac{t}{\tau_3}\right) \quad \text{S5}$$

Equation (S5) The triexponential fitting function, where A_1, A_2 and A_3 are constants, t is time, and τ_1, τ_2, τ_3 represent the decay lifetimes. The average lifetime (τ_{ave}) can be calculated as follows:

$$\tau_{ave} = \frac{A_1\tau_1^2 + A_2\tau_2^2 + A_3\tau_3^2}{A_1\tau_1 + A_2\tau_2 + A_3\tau_3} \quad \text{S6}$$

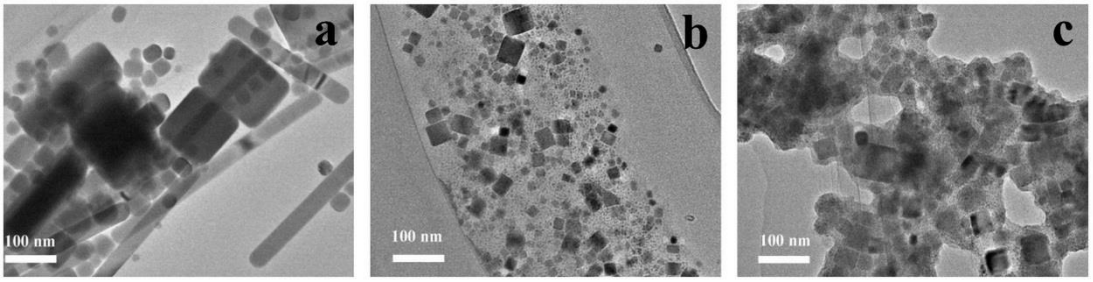

Fig. S1 TEM image of $CsPbBr_3$ as-synthesized nanocrystals by different amounts of OA and APTES (a) OA:APTES=2:1. (b) OA:APTES=1:2. (c) OA:APTES=1:3.

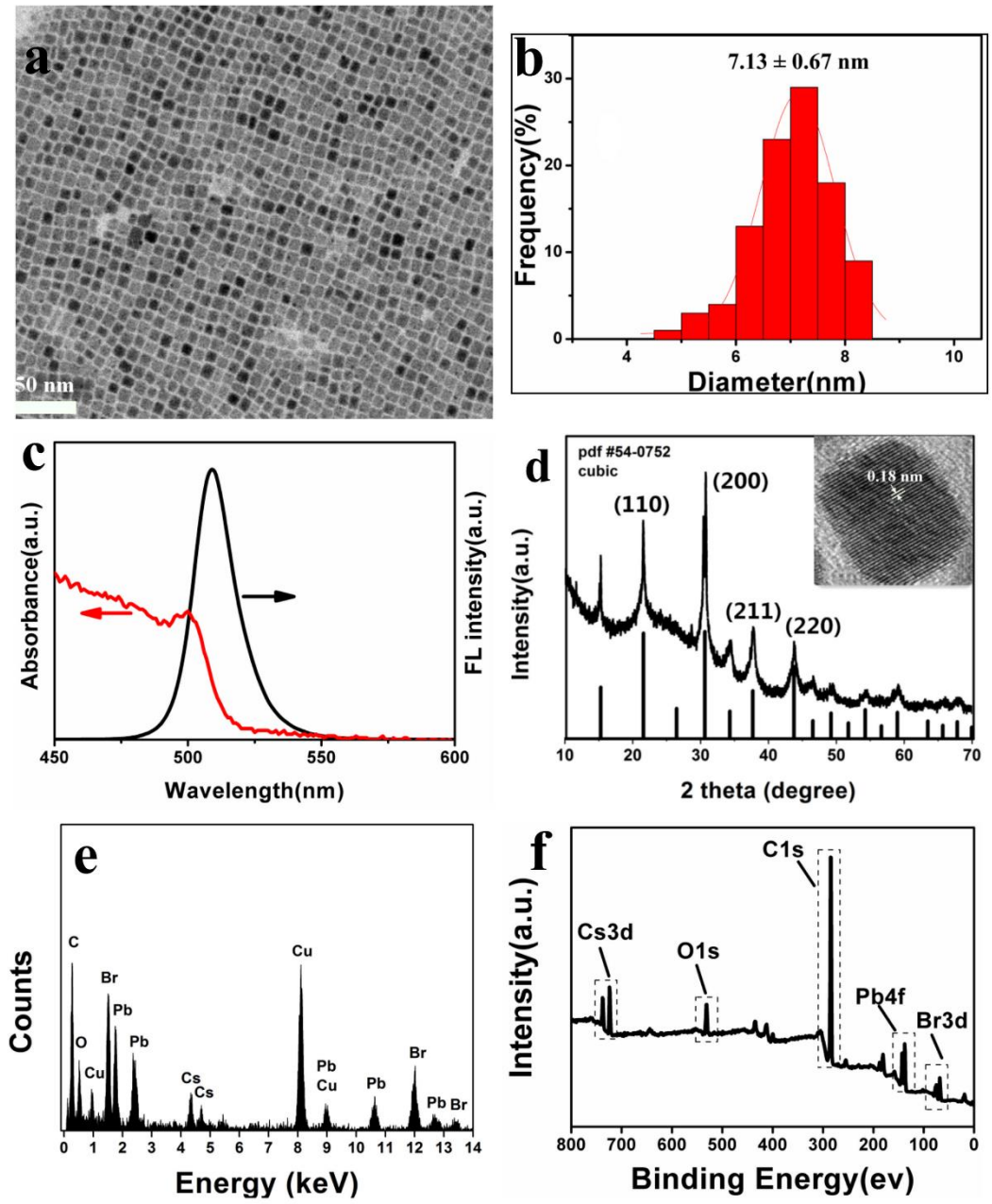

Fig. S2 $CsPbBr_3$ nanocrystals were prepared using OM. (a) TEM image. (b) Size distribution analysis for the samples. (c) Absorption and FL emission spectra (fwhm: 18 nm, Emission peak: 509 nm). (d) XRD patterns. (e) EDX spectrum. (f) XPS survey spectrum.

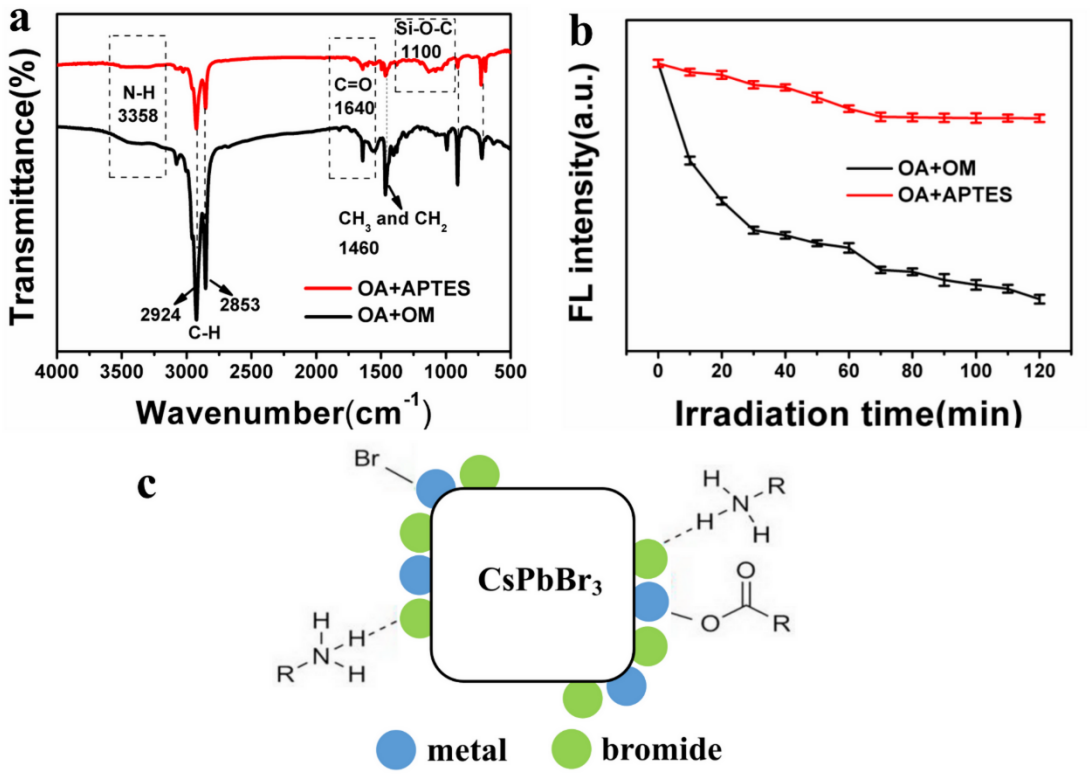

Fig. S3 (a) FTIR spectrum of $CsPbBr_3$ QDs in toluene solution (using OM in black line and using APTES in red line). (b) Photostability experiments high-pressure mercury lamp irradiation (365 nm). (c) Schematic diagram of the bonding forms of surface ligands and single quantum dot.[S2]

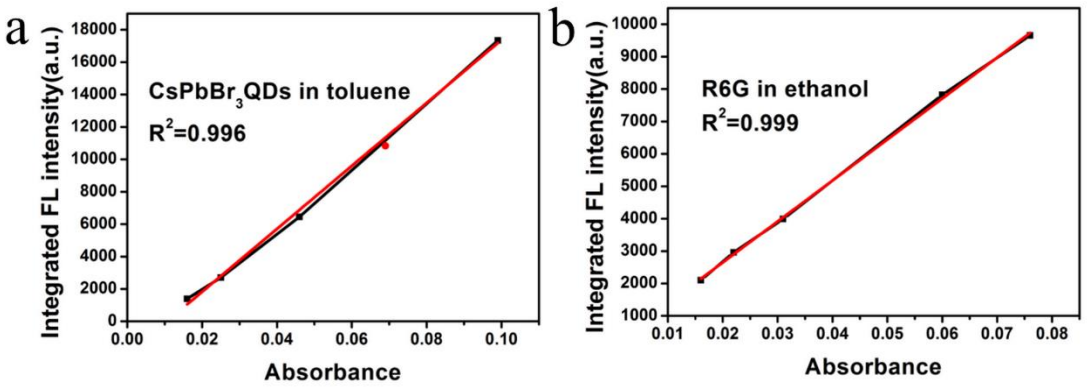

Fig. S4 Integrated FL intensity versus absorbance of the as-synthesized $CsPbBr_3$ QDs in toluene (a) and R6G in ethanol (b).

Table S1 The polarity magnitude of different solvents

Solvent	chloroform	ethanol	toluene
Polarity	4.4	4.3	2.4

Table S2 The atom ratios of Cs, Pb and Br (by EDX)

Element	Weight % (using OM)	Atomic %	Weight % (using APTES)	Atomic %
C K	11.5	45.5	3.6	16.1
O K	3.8	11.2	2.8	9.4
SiK	--	--	7.8	14.8
CsL	14.1	5.0	6.2	2.2
CuK	31.6	24.2	59.6	47.9
PbL	21.0	4.8	9.1	2.3
BrK	24.2	15.1	10.9	7.3
Total	100.0	100.0	100.0	100.0

Table S3 XPS results of as-prepared $CsPbBr_3$ nanocrystals

Name	Atomic%(using OM)	Atomic%(using APTES)
Cs 3d	1.15	2.27
Pb 4f	1.10	2.31
Br 3d	4.18	8.28

References

S1 A. T. Rhys Williams, S. A. Winfield and J. N. Miller, *Analyst*, 1983, **108**, 1067.

S2 J. De Roo, M. Ibáñez, P. Geiregat, G. Nedelcu, W. Walravens, J. Maes, J. C Martins, I. Van Driessche, M. V. Kovalenko and Z. Hens, *ACS Nano*, 2016, **10**, 2071.