Supporting Information

Full-Spectral Fine-Tuning Visible Emissions from Cation Hybrid $Cs_{1-m}FA_mPbX_3$ (X=Cl, Br and I, 0≤m≤1) Quantum Dots

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Table S1. Some optical parameters for $Cs_{1-m}FA_mPbBr_3$ HPQDs

QDs	Abs (nm)	Em (nm)	FWHM (nm)	Lifetime (ns)	PLQY (%)
$CsPbBr_3$	511	519	22	11	56
$Cs_{0.9}FA_{0.1}PbBr_3$	512	520	22	13	59
$Cs_{0.8}FA_{0.2}PbBr_3$	514	522	22	15	63
$Cs_{0.6}FA_{0.4}PbBr_3$	516	524	23	18	65
$Cs_{0.5}FA_{0.5}PbBr_3$	518	525	23	32	71
$Cs_{0.4}FA_{0.6}PbBr_3$	520	527	24	38	73
$Cs_{0.2}FA_{0.8}PbBr_3$	522	532	24	46	78
$Cs_{0.1}FA_{0.9}PbBr_3$	525	533	25	51	85
$FAPbBr_3$	527	538	25	69	69

Table S2. The calculated values of tolerance factor for a series of $Cs_{1-m}FA_mPbX_3$ QDs

$Cs_{1-m}FA_mPbX_3$	Cl	Cl:Br=2:1	Cl:Br=1:2	Br	Br:I=2:1	Br:I=1:2	I
m=0	0.820	0.818	0.817	0.815	0.812	0.810	0.807
m=0.1	0.829	0.827	0.825	0.823	0.821	0.818	0.815
m=0.2	0.838	0.836	0.834	0.832	0.829	0.826	0.823
m=0.4	0.856	0.854	0.851	0.849	0.845	0.842	0.839
m=0.5	0.865	0.862	0.860	0.858	0.854	0.850	0.847
m=0.6	0.874	0.871	0.869	0.866	0.862	0.858	0.855
m=0.8	0.892	0.889	0.886	0.883	0.879	0.875	0.871
m=0.9	0.901	0.898	0.895	0.892	0.887	0.883	0.879
m=1.0	0.910	0.906	0.903	0.900	0.895	0.891	0.886

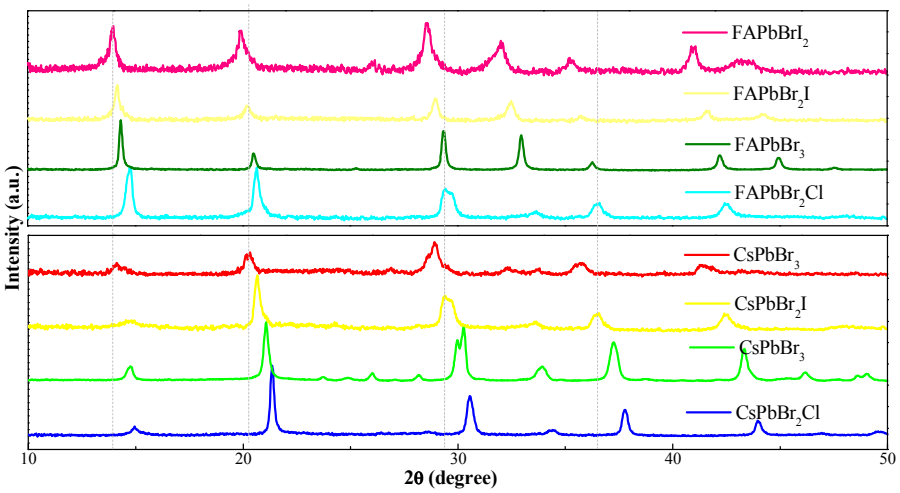

Figure S1. XRD patterns of $CsPbX_3$ and $FAPbX_3$ (X=Cl, Br and I or their mixture of Cl/Br and Br/I) samples.

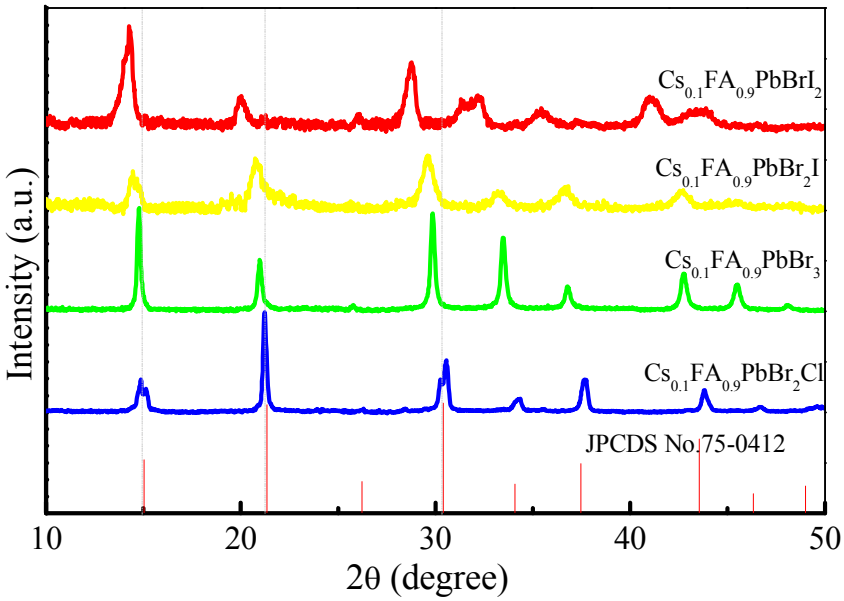

Figure S2. XRD patterns of $Cs_{0.1}FA_{0.9}PbX_3$ (X=Cl, Br and I or their mixture of Cl/Br and Br/I) samples. Bars represent standard diffraction data of cubic $CsPbBr_3$ crystal (JPCDS No. 75-0412).

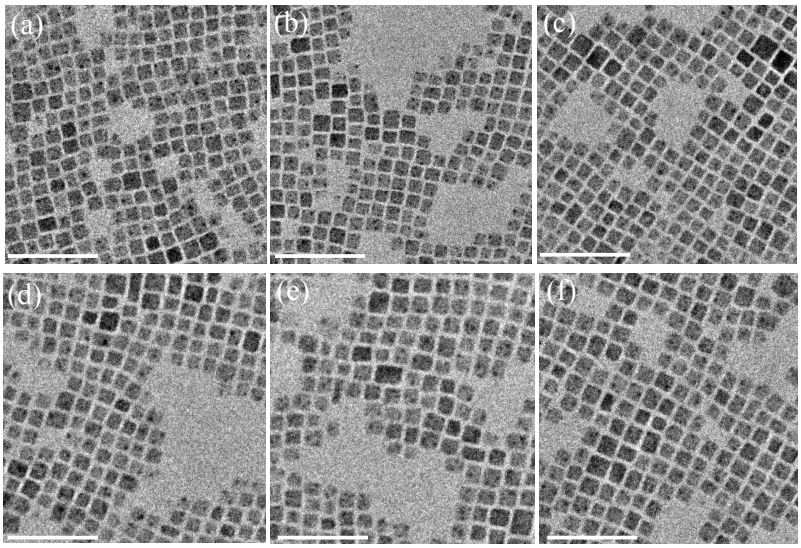

Figure S3. TEM images of $Cs_{1-m}FA_mPbBr_3$ HPQDs: (a) m=0, (b) m=0.2, (c) m=0.4, (d) m=0.6, (e) m=0.8 and (f) m=1.0. Scale bars: 50 nm.

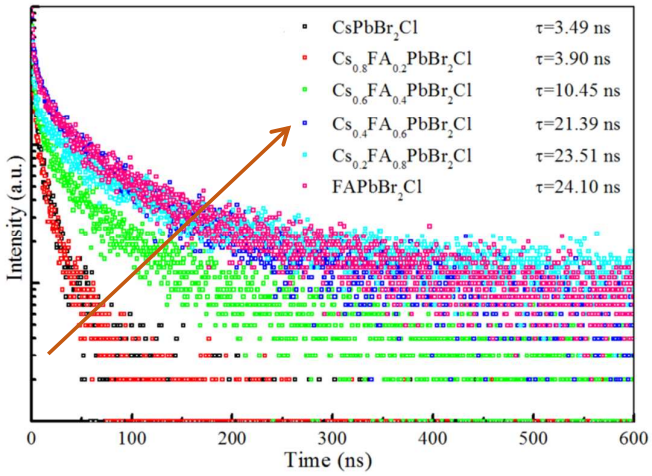

Figure S4. Time-resolved PL decays for the $Cs_{1-m}FA_mPbBr_2Cl$ HPQDs under the excitation of 375 nm picosecond laser.

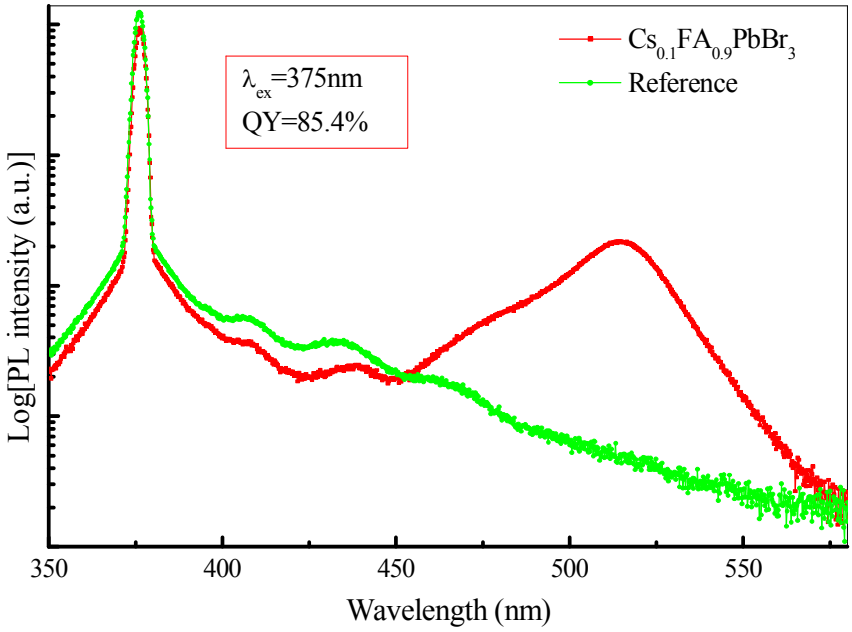

Figure S5. Quantitative excitation and emission spectra (λ_{ex}=375 nm) of the reference and typical $Cs_{0.1}FA_{0.9}PbBr_3$ sample recorded by a spectrofluoremeter equipped with an integrating sphere for QY measurement.

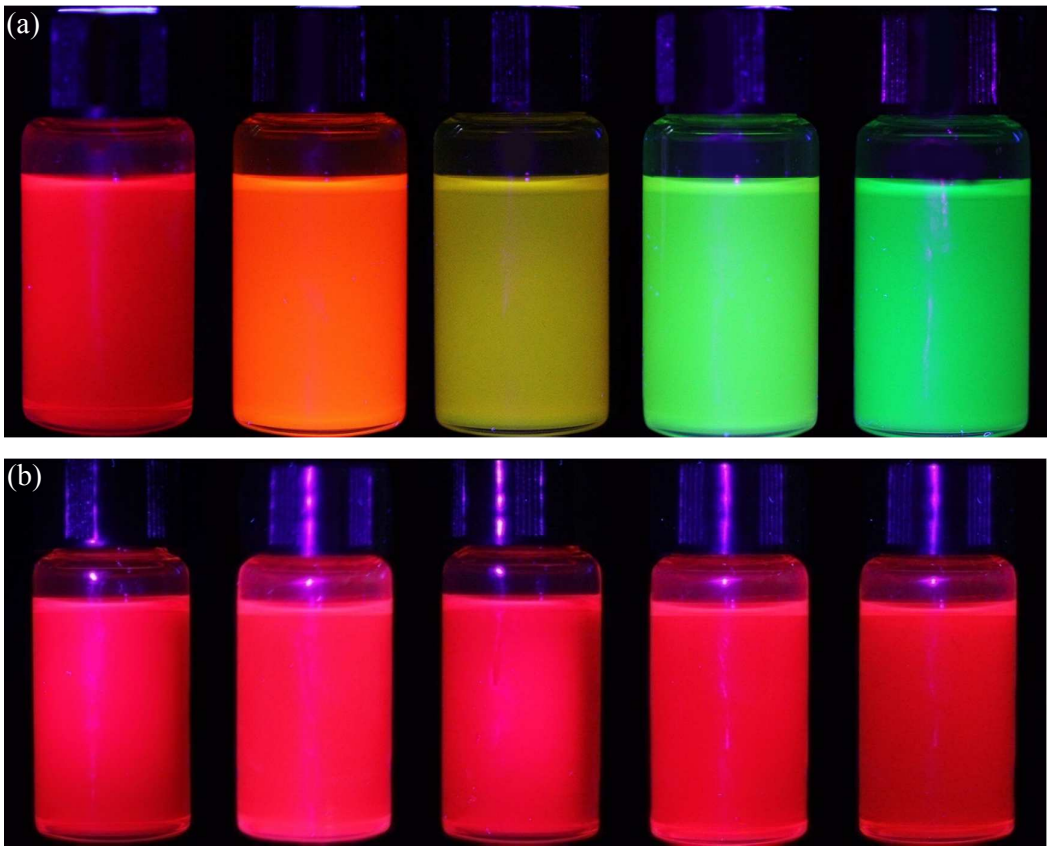

Figure S6. The variation of emission color with the extension of resting time (left to right: 0, 0.5, 1, 2 and 3h) for QDs solution: (a) $CsPbBrI_2$ and (b) $Cs_{0.1}FA_{0.9}PbBrI_2$.

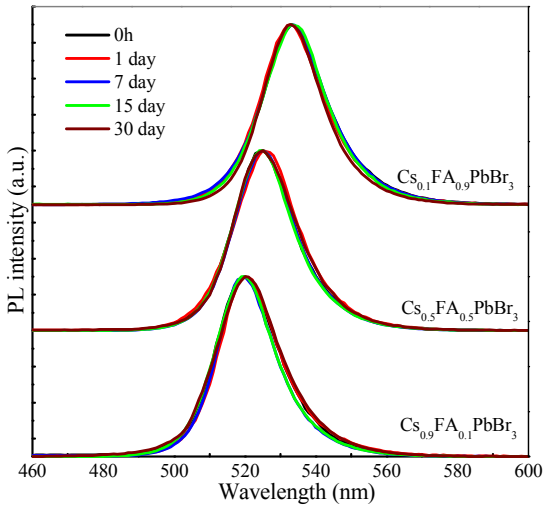

Figure S7. PL spectra of $Cs_{1-m}FA_mBr_3$ (m=0.1, 0.5, 0.9) HPQDs for the duration of one month to demonstrate their excellent structure stability.

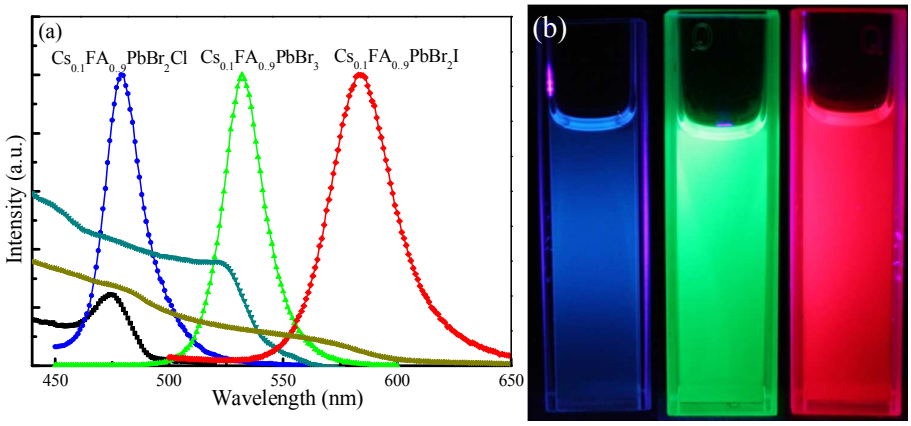

Figure S8. (a) Optical absorption/PL spectra for three typical $Cs_{0.1}FA_{0.9}PbClBr_2$, $Cs_{0.1}FA_{0.9}PbBr_3$ and $Cs_{0.1}FA_{0.9}PbBr_2I$ QDs, respectively. (b) Luminescent photographs for the corresponding QDs, showing blue, green and red emissions under the excitation of UV lamp.