Electronic Supplementary Material (ESI) for RSC Advances.

High Quality $CsPbBr_3$ Perovskite Nanocrystals for Quantum Dot Light-Emitting Diode

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Time-resolved photoluminescence decay measurement: The fluorescence lifetime (τ) was assessed by time-resolved photoluminescence measurements. The decay trace was fitted using biexponential functions Y(t) based on non-linear least squares analysis in Equation (1)

$$Y(t)=\alpha_1 \exp(-t/\tau_1)+\alpha_2 \exp(-t/\tau_2) \quad (1)$$

Where α_1 and α_2 are the fractional contributions of timeresolved decay lifetime of τ_1 and τ_2.

Table S1. The atom ratios of Cs, Pb and Br (by EDX)

Element Line	Weight %	Atom %
C K	26.54	63.89
O K	2.35	6.92
Br L	30.36	17.91
Cs L	15.82	5.61
Pb L	24.93	5.67
Total	100.00	100.00

Table S2. Chemical Composition of the Exchanged NCs (by EDX)

$CsPbBr_3$ (mL)	MAX (mmol)	EDX composition	PL (nm)
10	_	$CsPbBr_3$	520
10	MACl: 1.00	$Cs_{0.4}MA_{0.6}Pb(Cl/Br)_3$	480
10	MACl: 2.00	$Cs_{0.3}MA_{0.7}Pb(Cl/Br)_3$	455
10	MAI: 1.00	$Cs_{0.3}MA_{0.7}Pb(Br/I)_3$	585
10	MAI: 2.00	$Cs_{0.2}MA_{0.8}Pb(Br/I)_3$	650

Supporting Figures

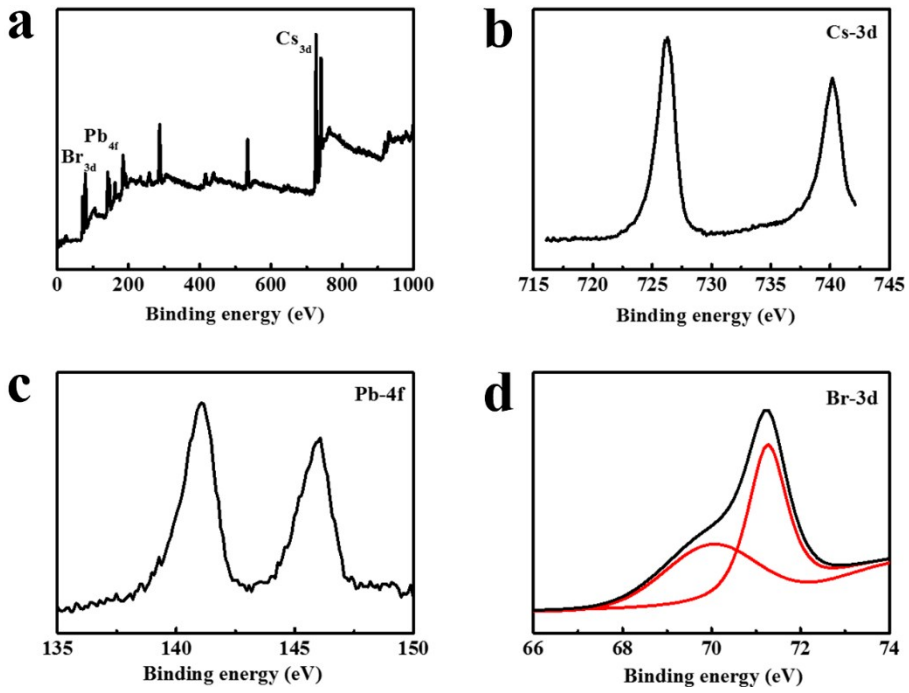

Fig. S1. (a) XPS survey spectrum of $CsPbBr_3$ perovskite NCs. (b-d) High-resolution XPS (b) Cs 3d, (c) Pb 4f (d), Br 3d spectra of $CsPbBr_3$ perovskite NCs.

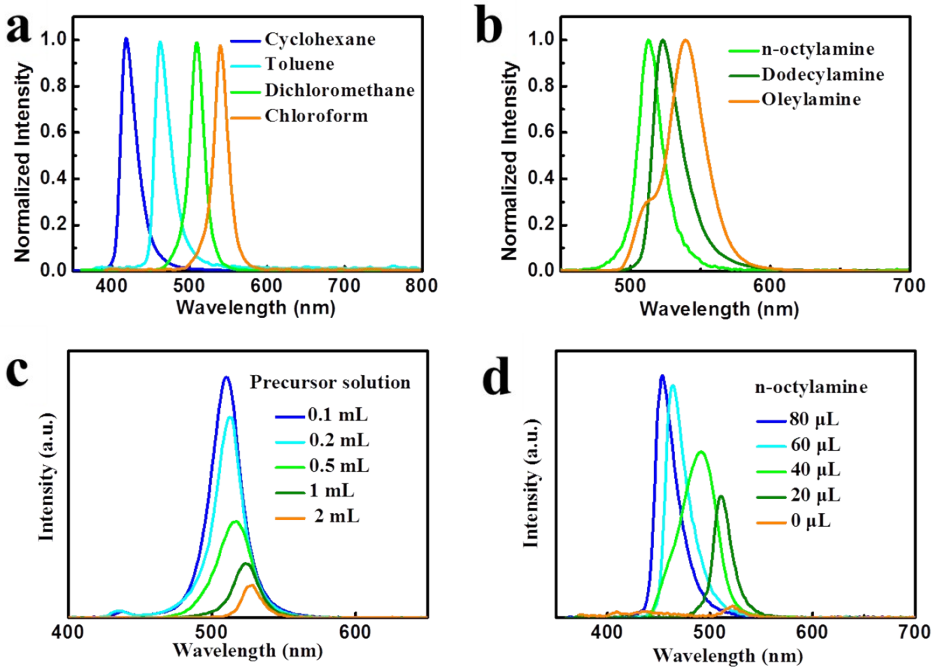

Fig. S2. $CsPbBr_3$ CNs exhibit a size-tunable bandgap with narrow and bright emission: (a) the influence of organic solvent with various polarities; (b) the influence of different ligands (long-chain alkyl amine). Evolution of the PL spectra of $CsPbBr_3$ CNs: (c) adding different amount of precursor solution and (d) adding different amount of *n*-octylamine (λ_{ex} = 365 nm for all).

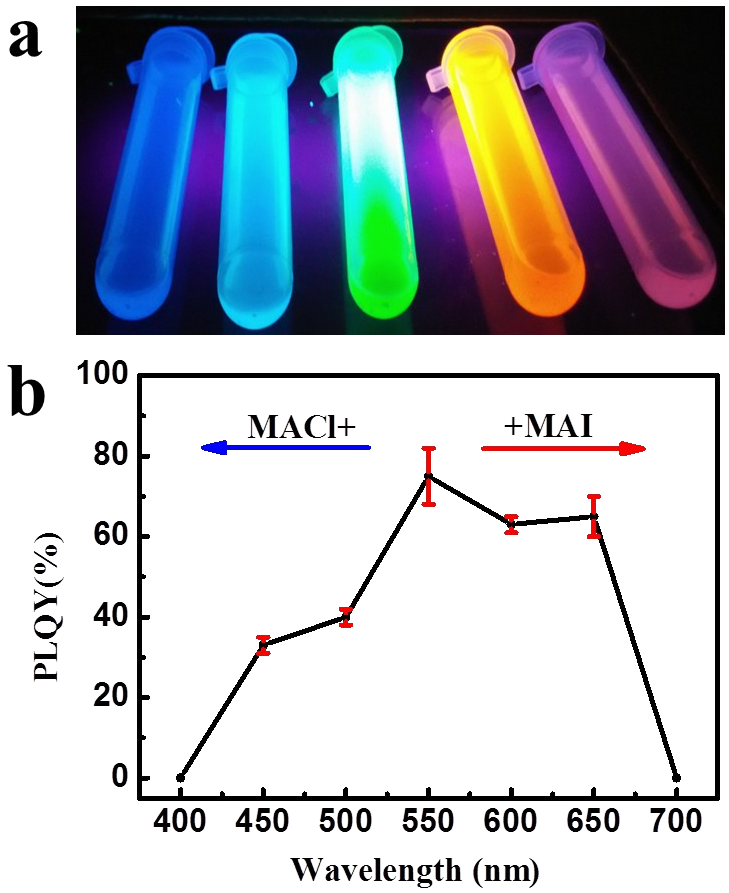

Fig. S3. (a) Composition-tunable bandgap energies covering the entire visible spectral region with narrow and bright emission of colloidal solutions in toluene under UV lamp; (b) The corresponding spectra of PLQY

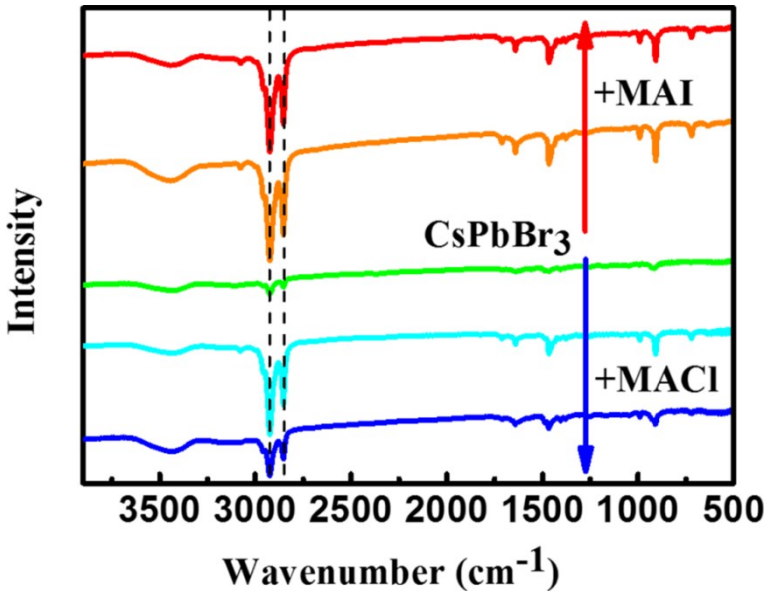

Fig. S4. FTIR patterns of the parent $CsPbBr_3$ NCs and ion-exchanged samples.

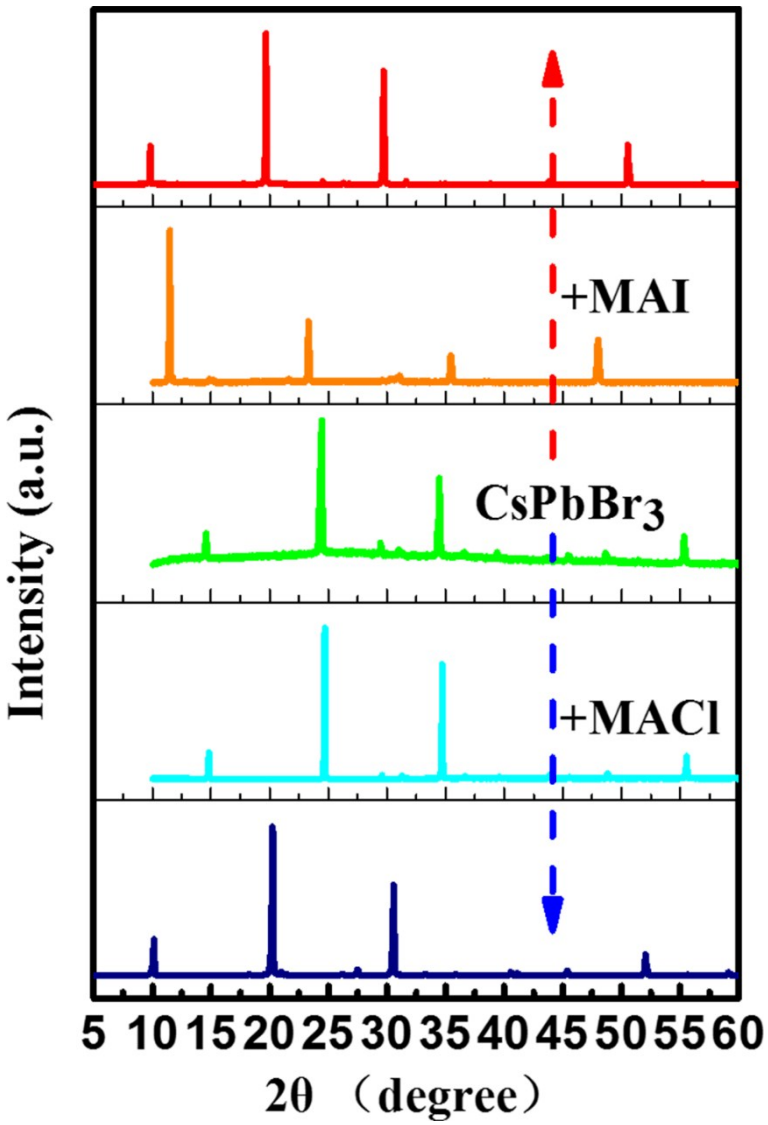

Fig. S5. XRD patterns of the parent $CsPbBr_3$ NCs and ion-exchanged samples.