Supplementary Material

One-Pot Synthesis of $CsPbBr_3$ Nanocrystals in Methyl Methacrylate: Kinetic Study, *in situ* Polymerization, and Backlighting Application

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Table S1 PL emission peaks and FWHMs of PNCs synthesized in ODE (160℃, 100℃), toluene (100℃), MMA (100℃) and ethyl acetate (80℃).

	ODE @160℃	ODE @100℃	Toluene @100℃	MMA @100℃	Ethyl acetate @80℃
Peaks (nm)	507	455 488 512	464 493 515	493 509 546	489
FWHM (nm)	24	38.99	37.4	32.15	34

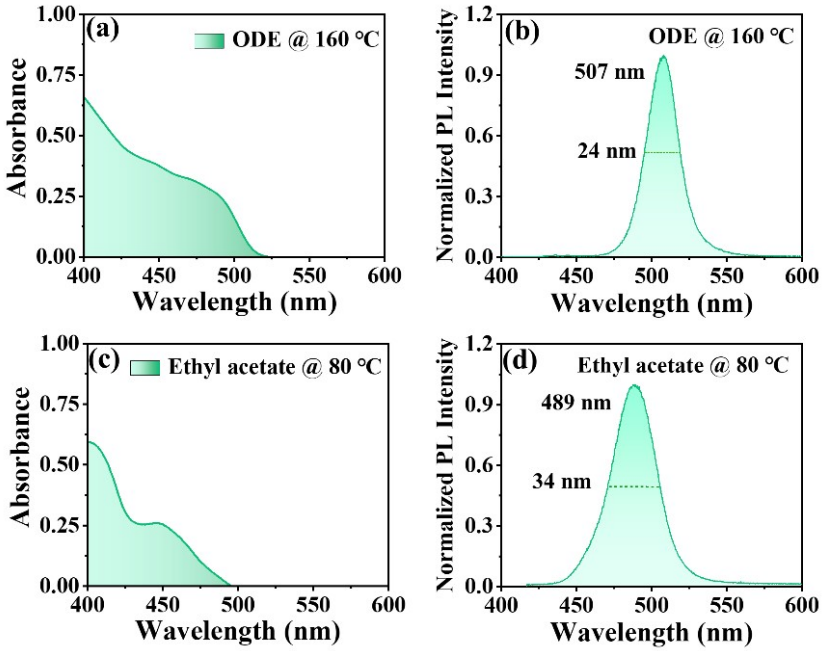

Fig. S1 Spectra of PNCs synthesized by injection (a) absorbance spectra at 160°C in ODE, (b) PL spectra at 160°C in ODE, (c) absorbance spectra at 80°C in ethyl acetate, (d) PL spectra at 80°C in ethyl acetate.

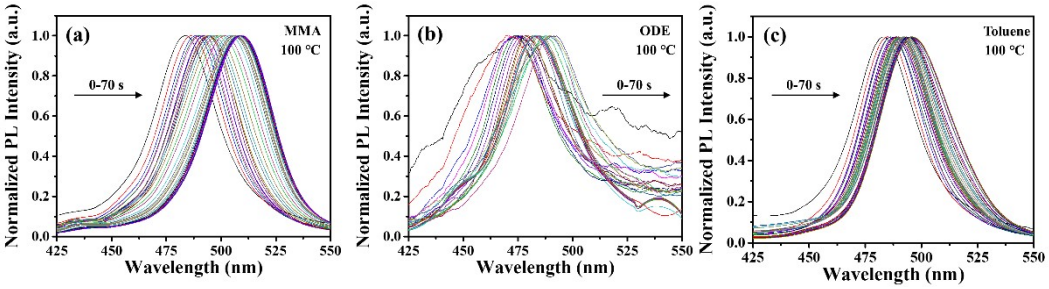

Fig. S2 PL spectra of PNCs synthesized at 100 °C in (a) MMA, (b) ODE and (c) toluene.

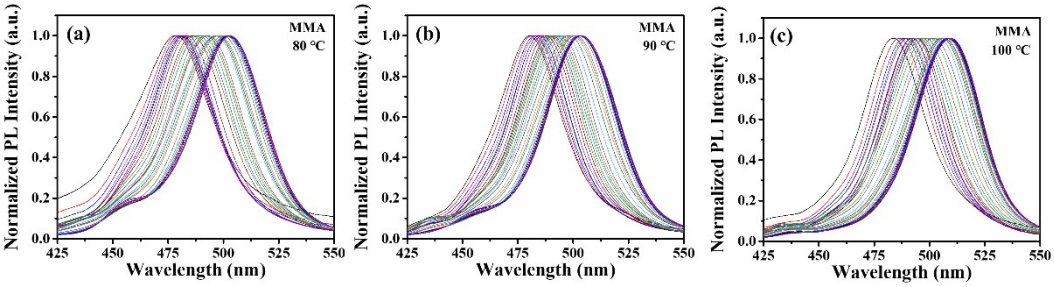

Fig. S3 PL spectra of PNCs synthesized in MMA with different react temperature.

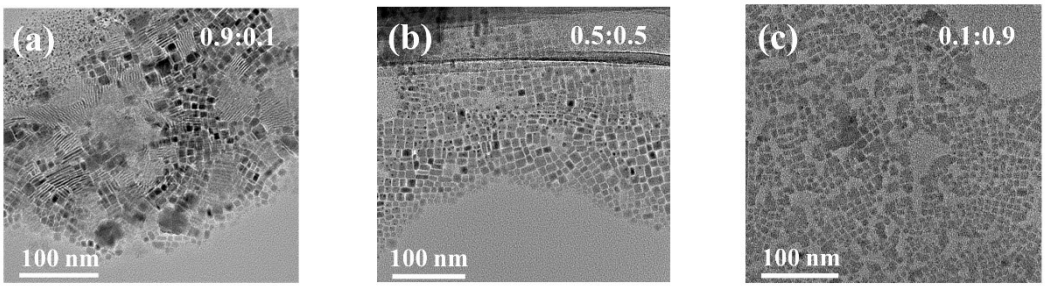

Fig. S4 TEM morphology of PNCs obtained at the ratio of OA:OAm of (a) 0.9:0.1, (b) 0.5:0.5, and (c) 0.1:0.9.

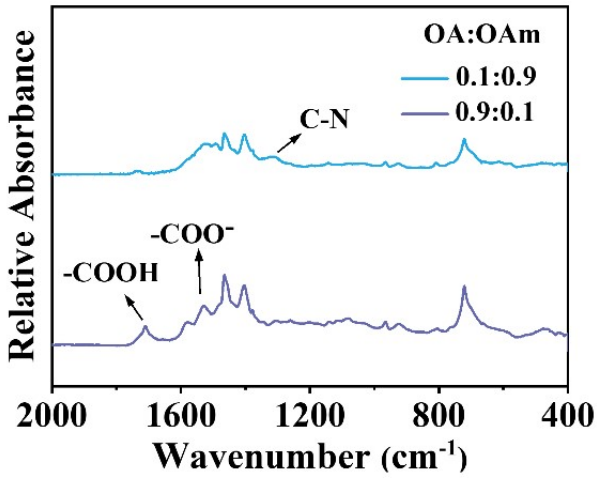

Fig. S5 FTIR spectra of PNCs prepared at the OA:OAm ratio of 0.9:0.1 and 0.1:0.9.

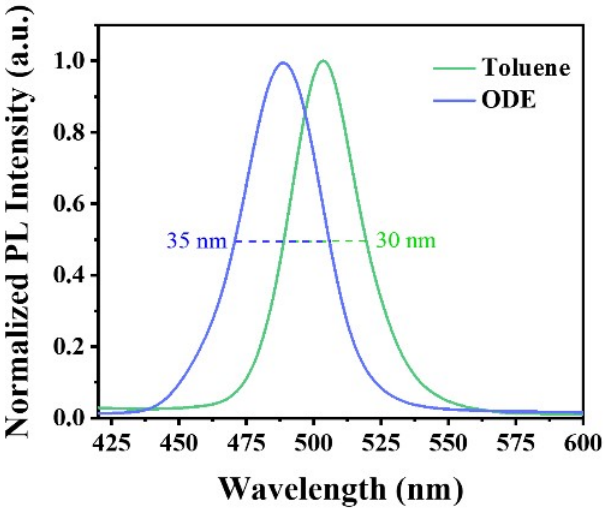

Fig. S6 PL spectra of PNCs prepared in ODE and toluene under amine-rich conditions.

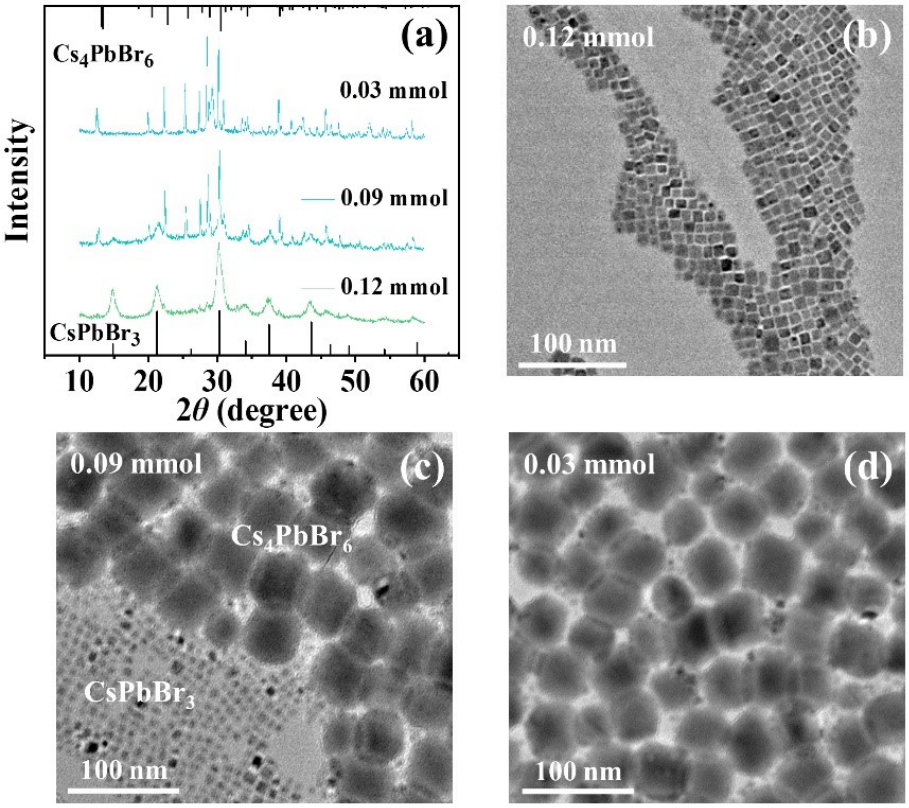

Fig. S7 (a) XRD pattern of the PNCs prepared with different amount of $PbBr_2$. TEM images of the PNCs synthesized with (b) 0.12 mmol, (c) 0.09 mmol, and (d) 0.03 mmol $PbBr_2$.

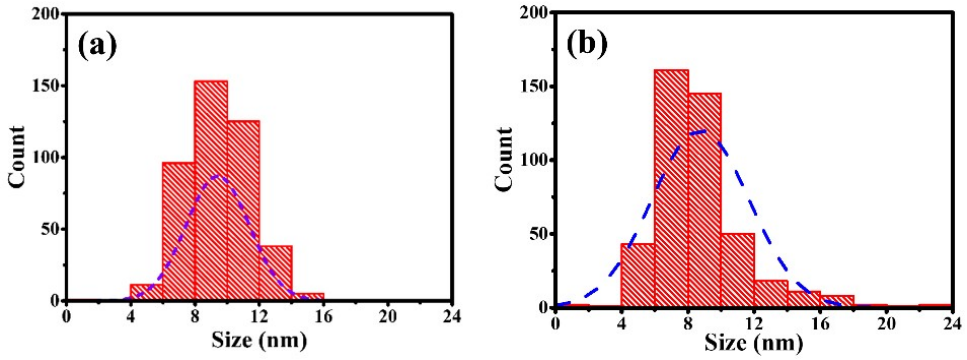

Fig. S8 Histograms of the size distribution of the synthesized PNCs (a) 0.12 mmol $PbBr_2$, and (b) 0.18 mmol $PbBr_2$.

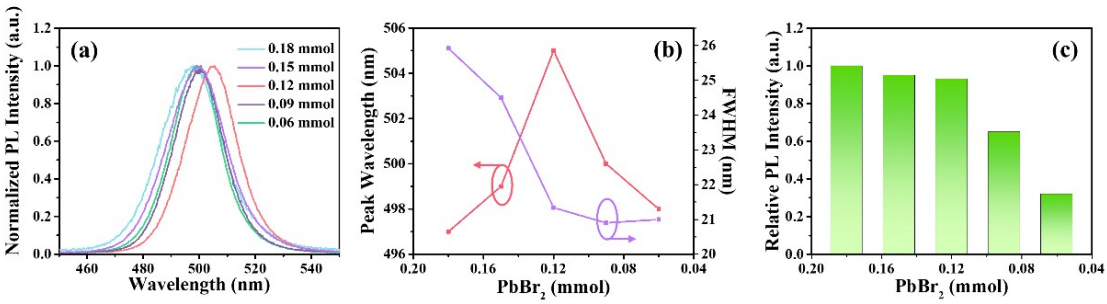

Fig. S9 (a) PL spectra, (b) corresponding emission peak and FWHM change trend and (c) PL intensity of PNCs obtained at early growth time with different amount of $PbBr_2$ precursor.

Table S2. Time-resolved PL lifetime data of the PNCs synthesized in MMA through one-pot injection (OP) and recrystallization (RE) method.

Sample	τ_1(ns)	%	τ_2(ns)	%	τ_3(ns)	%	$\bar{\tau}$(ns)
OP-PNCs	4.86	38.50	18.63	41.05	101.84	20.45	30.34
RE-PNCs	4.91	17.9	27.55	27	240.27	55.10	140.7

The PL lifetime was fitted with a triple exponential decay function as shown below,

$$y = A_1 e^{-\frac{t}{\tau_1}} + A_2 e^{-\frac{t}{\tau_2}} + A_3 e^{-\frac{t}{\tau_3}}$$

where the A_i and τ_i represent relative amplitude and the excited-state lifetime, respectively. τ_1 represents the radiative recombination path way of PNCs, τ_2 represents interaction between excitons and phonons, and τ_3 represents the interaction between excitons and defects. The OP-PNCs show an average decay time of 30.34 ns, while the RE-PNCs possess a long decay time of 140.7 ns. The higher proportion of τ_1 and τ_2 in OP-PNCs indicates a high proportion of direct recombination as well as strong exciton-phonon interaction, while the smaller proportion of τ_3 indicates lower defect concentration in OP-PNCs than in RE-PNCs.

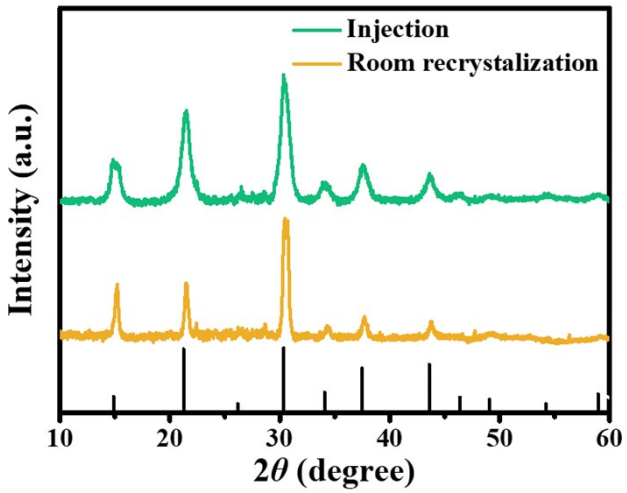

Fig. S10 XRD diffraction pattern of PNCs synthesized by injection method (green line) and room temperature recrystallization method (yellow line) method.

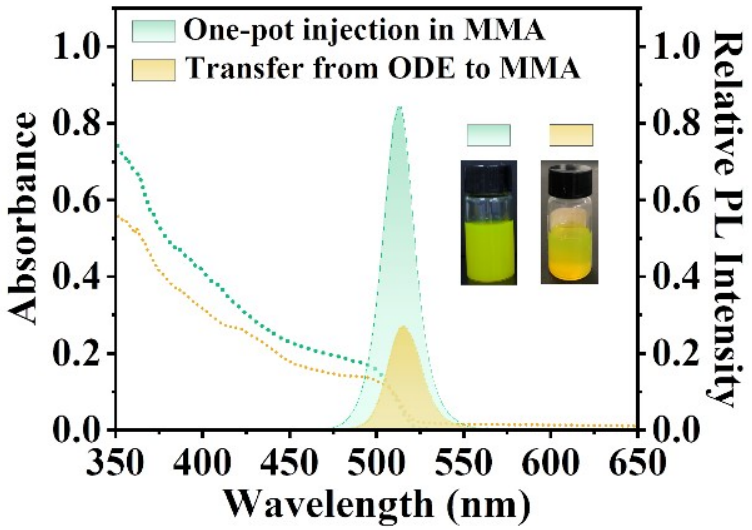

Fig. S11 Absorption and PL spectra of the one-pot synthesized PNCs and the PNCs synthesized in ODE via hot injection and transferred in MMA.

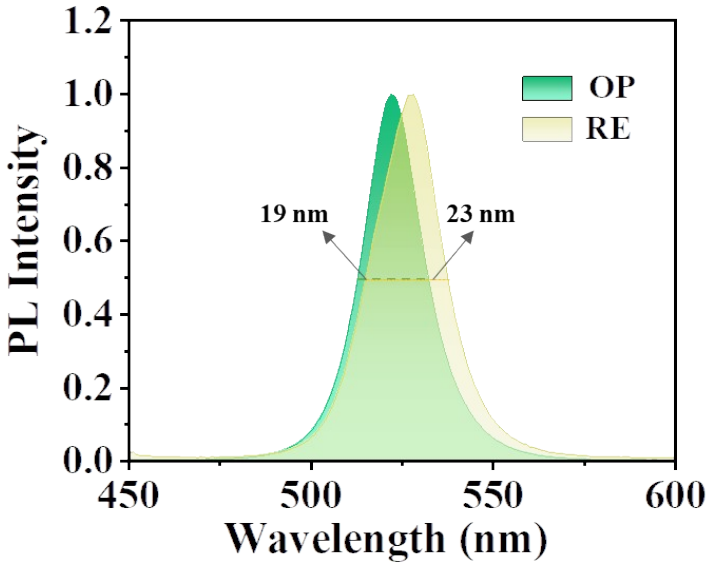

Fig. S12 Normalized PL spectra of the PNCs prepared by one-pot and recrystallization methods.

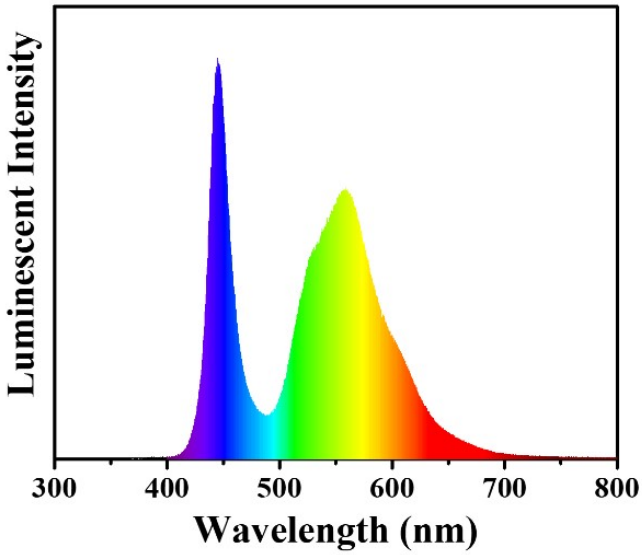

Fig. S13 Emission spectra of the original backlight module for LCD screen.