Electronic Supplementary Material (ESI) for Lab on a Chip.

Supplementary Information

Kinetic analysis of the growth behavior of perovskite $CsPbBr_3$ nanocrystals in a microfluidic system

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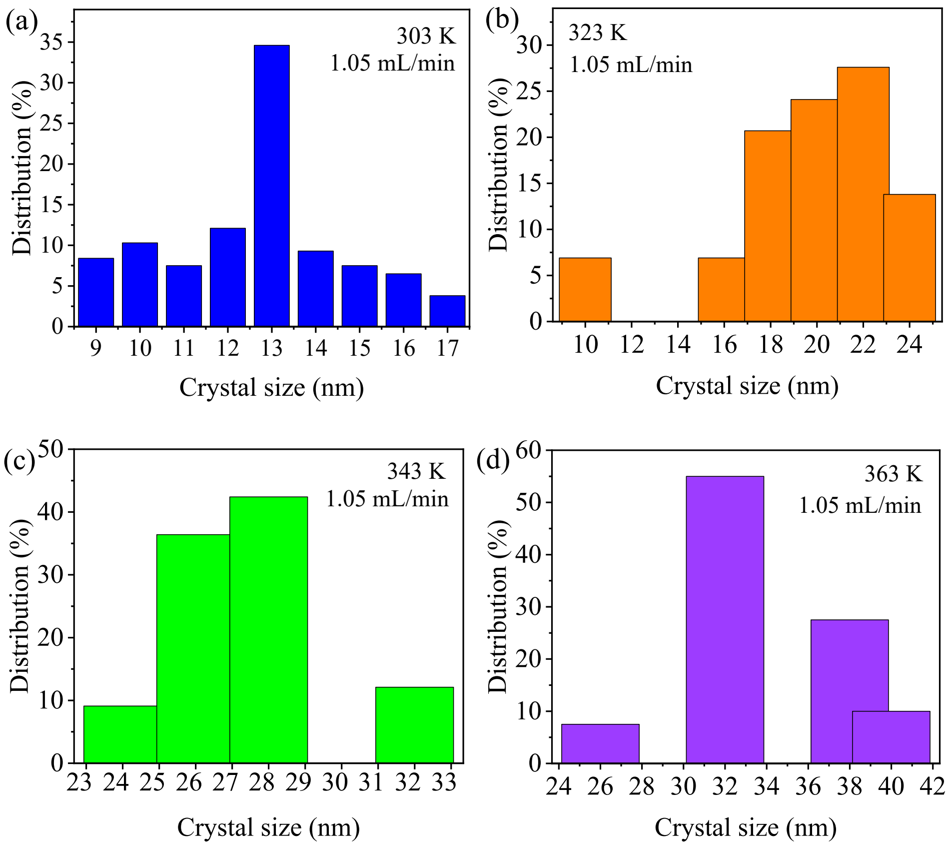

Figure S1. Histograms of the size distribution of the prepared $CsPbBr_3$ NCs as determined from the TEM images in Fig. 2 at different synthesis temperatures: (a) 303 K, (b) 323 K, (c) 343 K, and (d) 363 K.

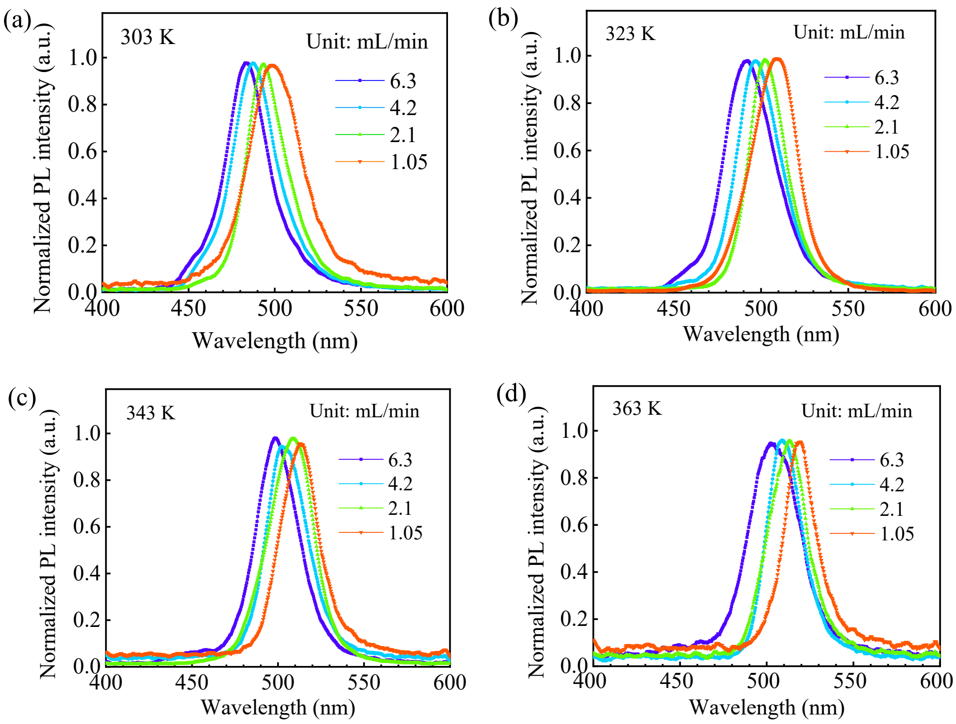

Figure S2. PL spectra of the $CsPbBr_3$ NCs prepared with total flow rates in a range of from 1.05 to 6.3 mL/min at different synthesis temperatures: (a) 303 K, (b) 323 K, (c) 343 K, and (d) 363 K.

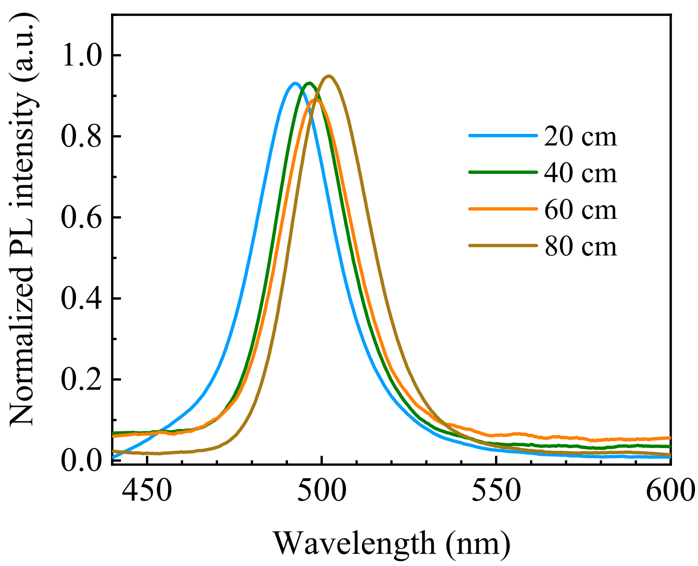

Figure S3. PL spectra of $CsPbBr_3$ NCs prepared at a fixed total flow rate of 1.05 mL/min with capillaries of different lengths for the growth of the $CsPbBr_3$ NCs.

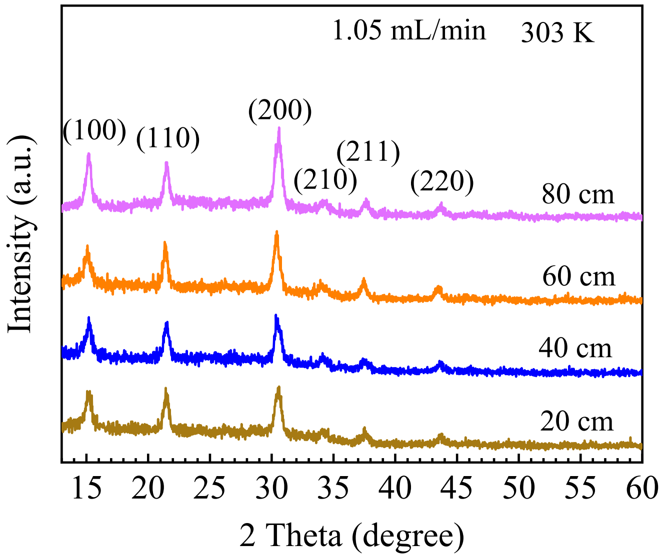

Figure S4. XRD patterns of $CsPbBr_3$ NCs prepared at a fixed total flow rate of 1.05 mL/min with capillaries of different lengths for the growth of the $CsPbBr_3$ NCs.

Table S1. Average Sizes of the prepared $CsPbBr_3$ NCs calculated from XRD spectra

Temperature	Crystal size			
	6.3 mL/min	4.2 mL/min	2.1 mL/min	1.05 mL/min
303 K	6.9 nm	8.2 nm	10.6 nm	11.4 nm
323 K	9.9 nm	11.6 nm	12.1 nm	12.7 nm
343 K	10.5 nm	12.0 nm	14.2 nm	16.7 nm
363 K	11.9 nm	14.9 nm	15.7 nm	17.0 nm

Calculation of Reynolds number (Re) of the NC solutions.

Using equation $Re=\rho vd/\mu$ (ρ, v, μ are density, flow velocity and viscosity of fluid. d is diameter of a capillary tube), we calculated the Reynolds number (Re) of the NC solutions in the capillary under four total flow rates at a temperature of 303 K, as shown in Tables S2-1 and S2-2 below.

Flow velocity:

1.05 mL/min = 1.75×10^{-8} m^3/s = 3.48×10^{-2} m/s (diameter of tube is 0.8 mm)

2.1 mL/min = 3.50×10^{-8} m^3/s = 6.96×10^{-2} m/s (diameter of tube is 0.8 mm)

4.2 mL/min = 7.00×10^{-8} m^3/s = 1.39×10^{-1} m/s (diameter of tube is 0.8 mm)

6.3 mL/min = 1.05×10^{-7} m^3/s = 2.09×10^{-1} m/s (diameter of tube is 0.8 mm)

ρ_{DMF} =0.94 (g/cm^3) [1] μ_{DMF} =0.759 mPa·s [1]

$\rho_{toluene}$ =0.86 (g/cm^3) [2] $\mu_{toluene}$ =0.53 mPa·s [2]

[1] Densities and Viscosities of N,N-Dimethylformamide + N-Methyl-2-pyrrolidinone and + Dimethyl Sulfoxide in the Temperature Range (303.15 to 353.15) K, Journal

of Chemical & Engineering Data, 2008, 53(7): 1639-1642.
[2] Viscosity of Toluene – viscosity table and viscosity chart :: Anton Paar Wiki (anton-paar.com)

(1) Fixed volume ratio of DMF to Toluene (Volume ratio: DMF/Toluene = 1/20)

$\rho = (1/21) \times \rho_{DMF} + (20/21) \times \rho_{toluene}$
$\mu = (1/21) \times \mu_{DMF} + (20/21) \times \mu_{toluene}$

Table S2-1. Reynolds numbers of the $CsPbBr_3$ NC solution at four total flow rates

Temperature	Reynolds number (Re)			
	1.05 mL/min	2.1 mL/min	4.2 mL/min	6.3 mL/min
303 K	44.4	88.8	177.5	266.3

(2) Various volume ratios of DMF to Toluene

Table S2-2. Reynolds numbers of the $CsPbBr_3$ NC solutions at four total flow rates under three volume ratios of precursor solution and toluene

	Reynolds number			
V_{DMF}:$V_{toluene}$	1.05 mL/min	2.1 mL/min	4.2 mL/min	6.3 mL/min
1:6	43.2	86.4	172.8	259.2
1:13	44.2	88.4	176.8	265.1
1:20	44.4	88.8	177.5	266.3