

One pot synthesis of heterostructure CsPbBr₃/PdSe nanowires with excellent humid stability

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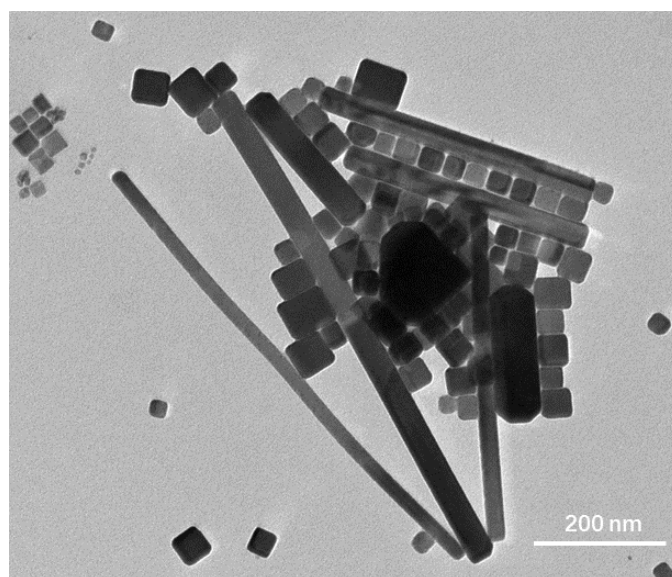


Figure S1 TEM morphology of the products prepared by only mixing Pb/Br precursor solution and Cs precursor solution

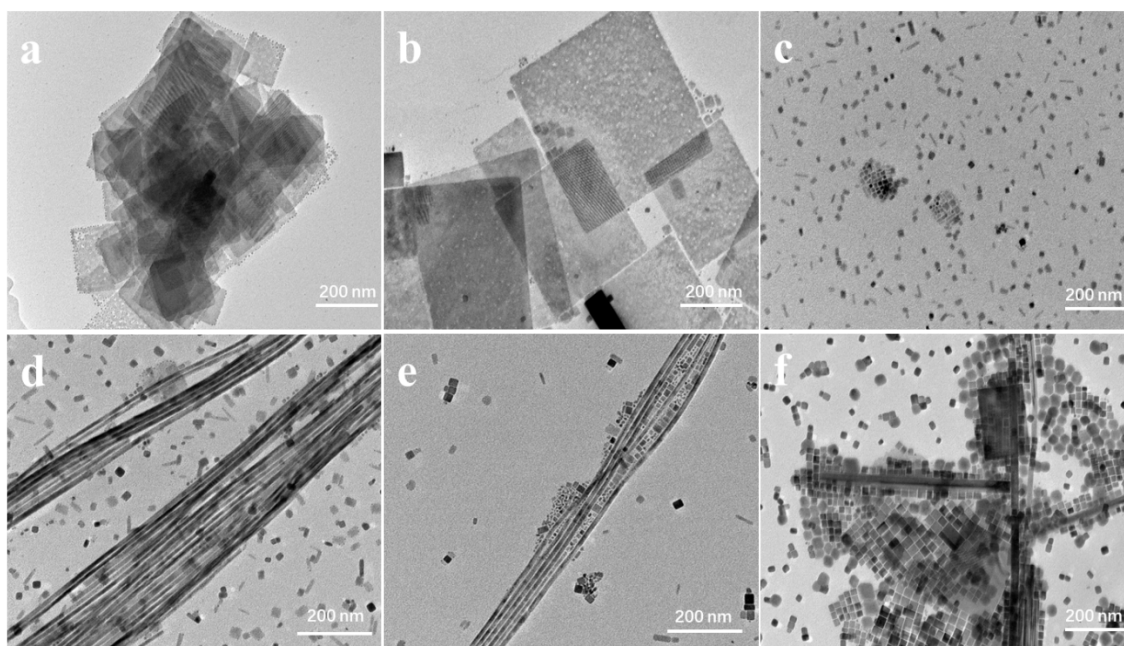


Figure S2 TEM morphologies of the products prepared by the above-mentioned process with constant proportional of OA and OLA. (a) 0.5 ml OA and 0.5 ml OLA; (b) 0.6 ml OA and 0.6 ml OLA; (c) 0.75 ml OA and 0.75 ml OLA; (d) 0.9 ml OA and 0.9 ml OLA; (e) 1.5 ml OA and 1.5 ml OLA; (f) 2.0 ml OA and 2.0 ml OLA

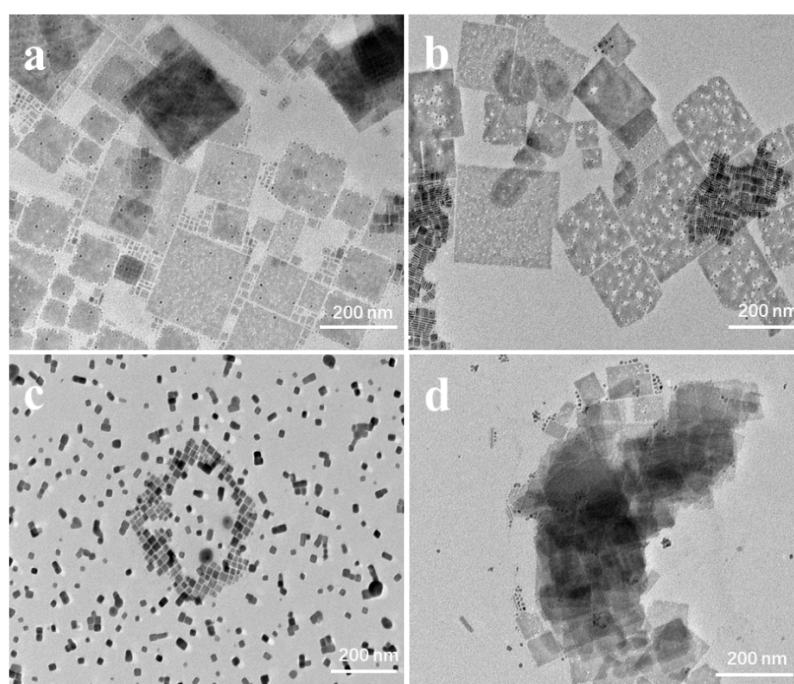


Figure S3 TEM morphologies of the products prepared by the above-mentioned process with different content of OA and OLA. (a) 0.5 ml OA and 1.0 ml OLA; (b) 1 ml OA and 0.5 ml OLA; (c) 1.0 ml OA and 2.0 ml OLA; (d) 2.0 ml OA and 1.0 ml

OLA

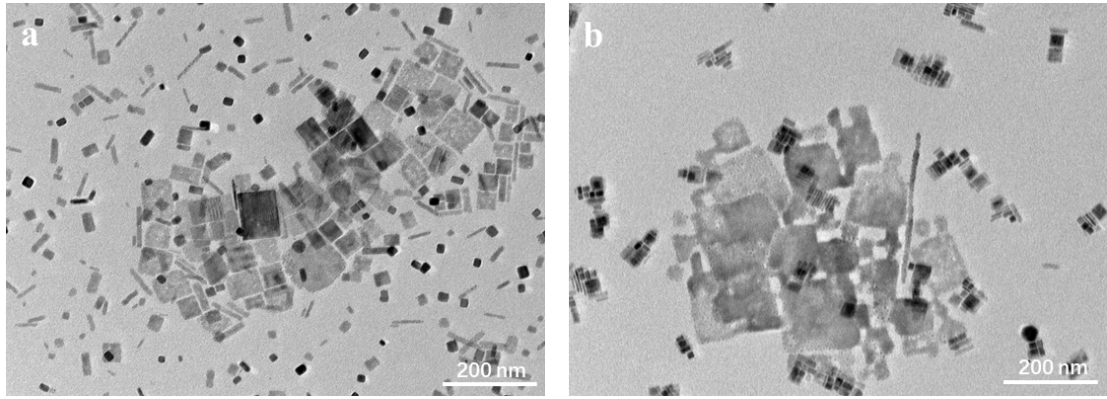


Figure S4 (a) TEM morphology of the products prepared by only mixing Pb/Br precursor solution and Cs precursor solution, (b) TEM morphology of the products prepared by mixing Pb/Br precursor solution, Cs precursor solution and 30 μl DDT.

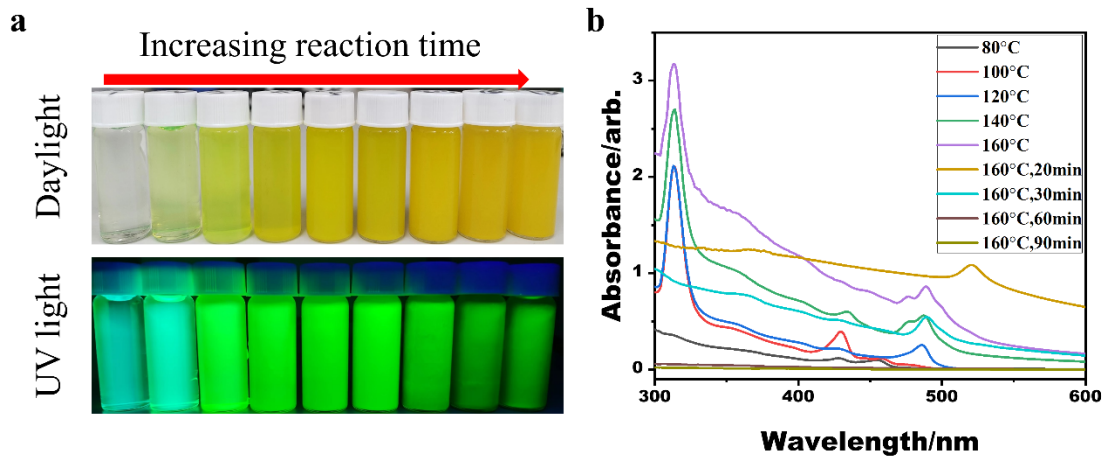


Figure S5 (a) Photograph and (b) UV/Vis absorption spectra of samples quenched at different time during the transformation from the precursor solution into NWs: (a) 80 $^{\circ}\text{C}$, (b) 100 $^{\circ}\text{C}$, (c) 120 $^{\circ}\text{C}$, (d) 140 $^{\circ}\text{C}$, (e) 160 $^{\circ}\text{C}$, 0 min, (f) 160 $^{\circ}\text{C}$, 20 min, (g) 160 $^{\circ}\text{C}$, 30 min, (h) 160 $^{\circ}\text{C}$, 60 min, (i) 160 $^{\circ}\text{C}$, 90 min

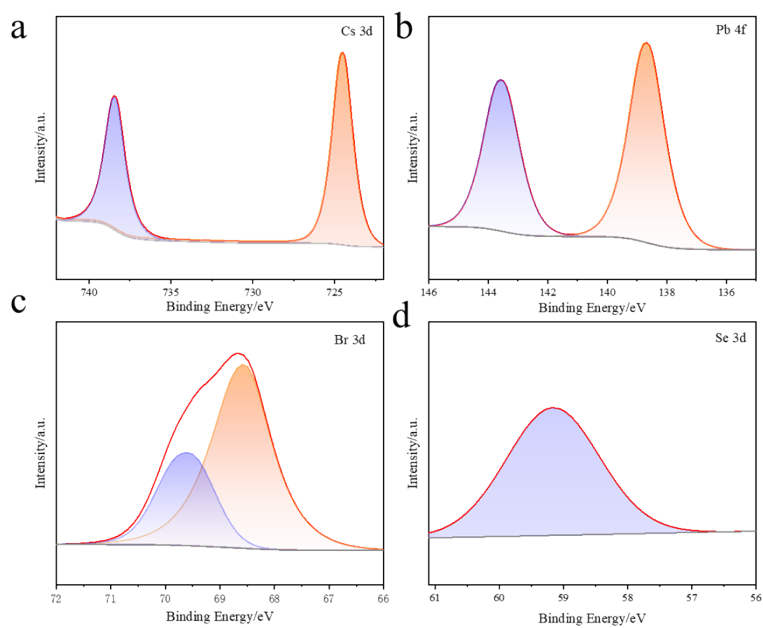


Figure S6 XPS spectra of CsPbBr₃/PbSe NWs: (a) Cs 3d, (b) Pb 4f, (c) Br 3d, and (d) Se 3d

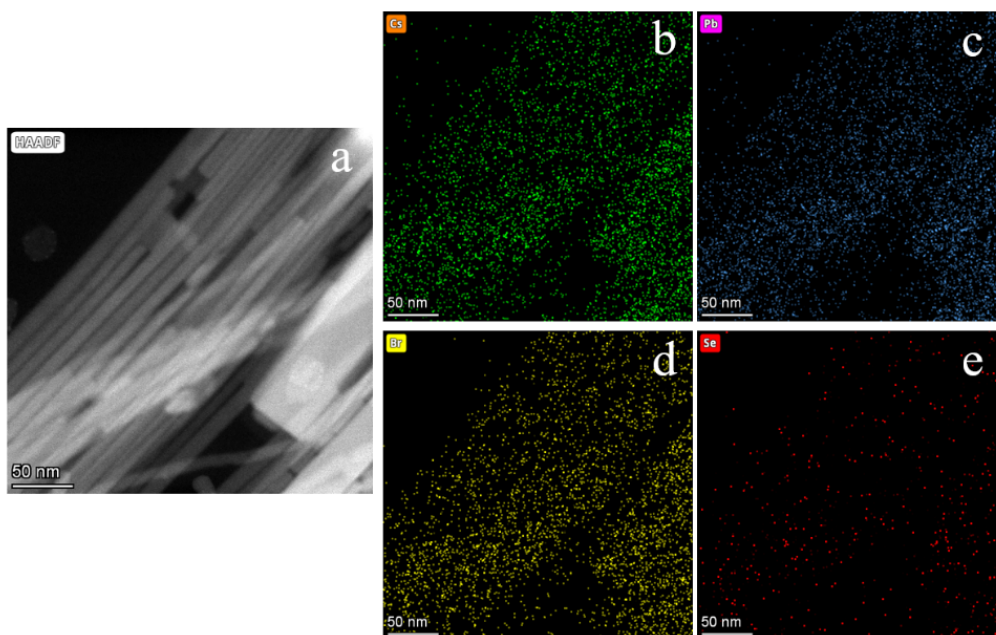


Figure S7 EDS elements analysis of CsPbBr₃/PbSe NWs: (a) HAADF-STEM image, (b) Cs element distribution, (c) Pb element distribution, (d) Br element distribution, (e) Se element distribution.

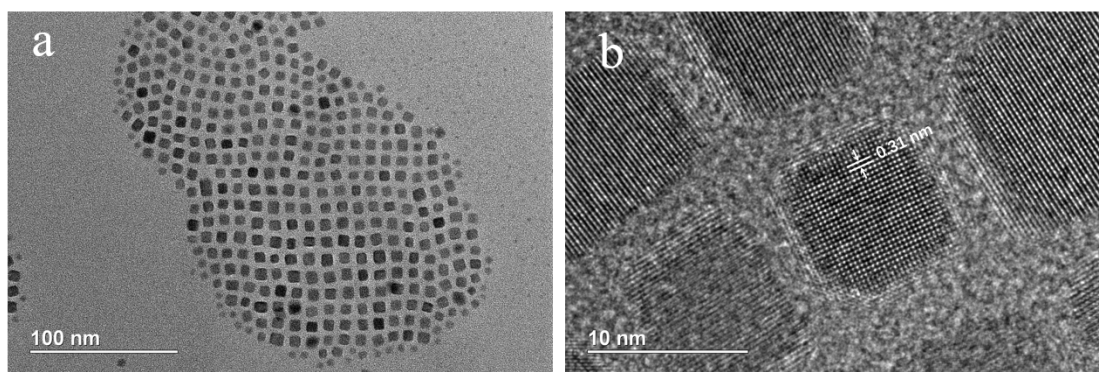


Figure S8 (a) TEM and (b) HRTEM images of PbSe nanoparticles. The PbSe nanoparticles were prepared as following: 5.75 ml Pb precursor solution and 0.3 ml Se solution were simultaneously added into 50-ml stand-up flask at room temperature. The mixed solutions were stirred under flowing Ar atmosphere, then heated quickly to 160 °C (~ 5 min). After keeping for 5 min at 160 °C, the reacted flask was cooled naturally to room temperature. The PbSe nanoparticles were centrifuged at 10000 rpm for 10 min and to dispersed in 10 mL hexane again and stored for subsequent use. Figure b showed a interplanar distance of ~ 0.31 nm, responding to the (200) plane of cubic PbSe.

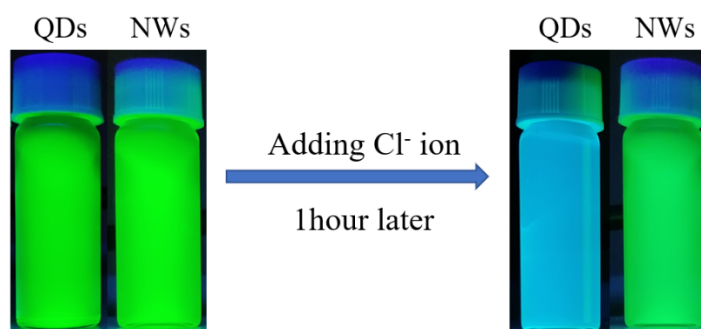


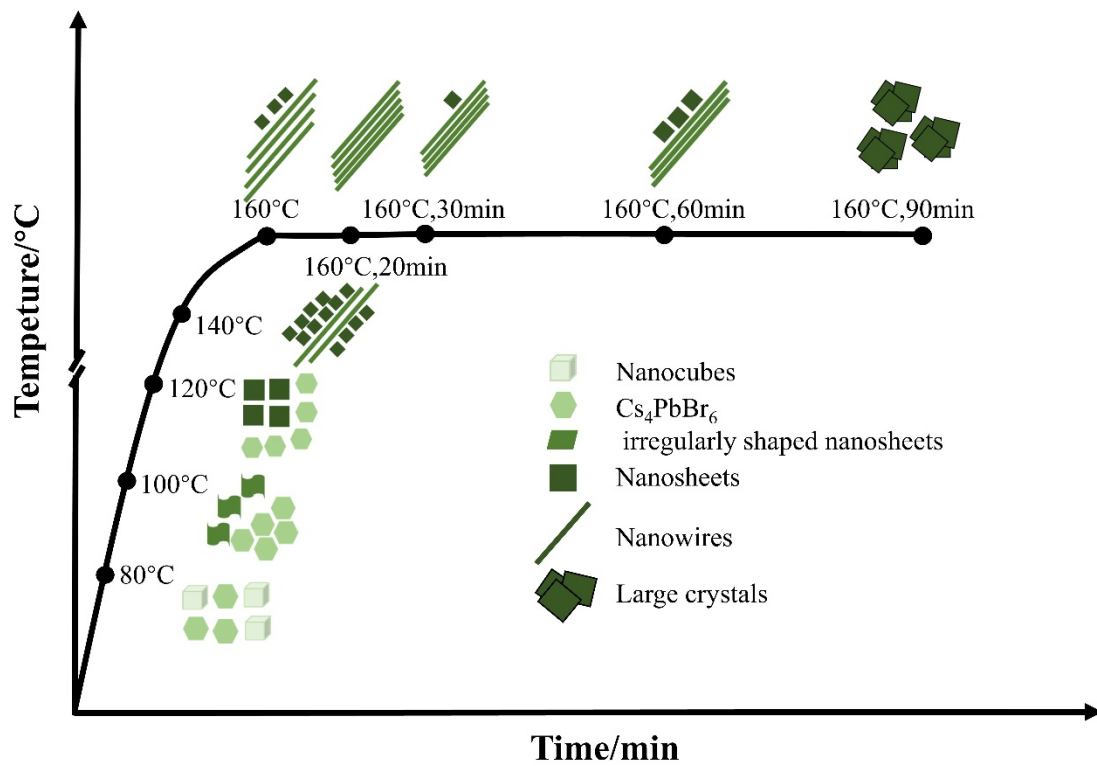
Figure S9 Photographs of CsPbBr₃ QDs and CsPbBr₃/PbSe NWs before and after exchanged with Cl⁻ ions under excitation of 365 nm lamp. It was clearly observed that the anion exchange reaction occurred in the CsPbBr₃ QDs solution, but not in the CsPbBr₃/PbSe NWs solution.

Table S1 Morphologies of the products synthesized at different conditions

PbBr ₂ (mmol)	Cs ₂ CO ₃ (mmol)	ODE (mL)	OA (mL)	OLA (mL)	Reaction Condition	Morphology		
						Nanocubes	Nanosheets	Nanowires
0.3	0.1	10	0.5	0.5	160°C,20min		√	
			0.6	0.6		√	√	
			0.75	0.75		√		
			0.9	0.9			√	√
			1	1				√
			1.5	1.5			√	√
			2	2		√	√	√
			0.5	1		√	√	
			1	0.5		√	√	
			1	2		√		
2	1	√	√					

Table S2 Morphologies of the products quenched at different stage during the preparation of CsPbBr₃/PbSe NWs

PbBr ₂ (mmol)	Cs ₂ CO ₃ (mmol)	ODE (mL)	OA (mL)	OLA (mL)	Reaction Condition	Morphology		
						Nanocubes	Nanosheets	Nanowires
0.3	0.1	10	1	1	80°C	√		
					100°C	√	√	
					120°C	√	√	
					140°C		√	√
					160°C	√		√
					160°C,20min			√
					160°C,30min			√
					160°C,60min		√	√
					160°C,90min		√	



Scheme S1 Schematic illustration of the morphology evolution during the preparation of CsPbBr₃/PbSe NWs