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Electronic Supplementary Information

$CsPbBr_3$ and $CsPbI_3$ rhombic dodecahedra and nanocubes displaying facet-dependent optical properties

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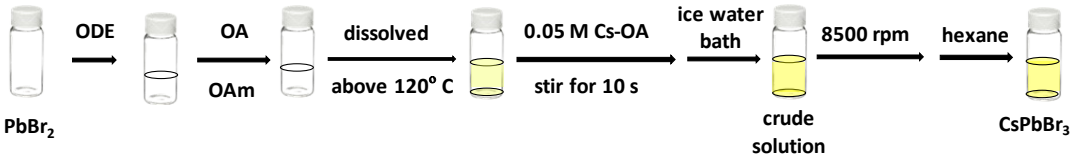
Table of contents

Fig. S1 Illustration of the $CsPbBr_3$ crystal synthesis process and the reagent amounts used 2
Fig. S2 SEM images showing the formation of $CsPbBr_3$ octahedra 2
Fig. S3 Size distribution histograms of the synthesized $CsPbBr_3$ crystals 3
Fig. S4 XRD patterns of the synthesized $CsPbBr_3$ crystals 4
Fig. S5 Photographs of the $CsPbBr_3$ particle solutions 4
Fig. S6 UV–vis spectrum of the prepared $CsPbBr_3$ nanocube solution. 5
Fig. S7 UV–vis absorption spectra of the synthesized $CsPbBr_3$ rhombic dodecahedra with tunable sizes and their Tauc plots 5
Fig. S8 Size distribution histograms of the prepared $CsPbI_3$ nanocubes 5
Fig. S9 XRD pattern of the synthesized $CsPbI_3$ nanocubes. 6
Fig. S10 Photographs of the $CsPbBr_3$ solution undergoing anion exchange reaction 6
Fig. S11 SEM image of the 130 nm $CsPbBr_3$ rhombic dodecahedra 7
Fig. S12 UV–vis absorption and photoluminescence spectra of the anion-exchanged $CsPbBr_3$ rhombic dodecahedra 7
Fig. S13 SEM images of a $CsPbBr_3$ rhombic dodecahedron and the converted $CsPbI_3$ rhombic dodecahedron 8
Fig. S14 Photographs of the $CsPbI_3$ solution undergoing anion exchange reaction 8
Fig. S15 SEM image of $CsPbI_3$ nanocubes and the converted $CsPbBr_3$ nanocubes 8



shape	$PbBr_2$ (g)	ODE (mL)	OA (mL)	OAm (mL)
cubes	0.275	13.5	0.75	0.75
rhombic dodecahedra				
octahedra		13.3	1.2	0.5

Shape	0.05 M Cs_2CO_3	0.05 M $PbBr_2$	Temperature (° C)
cubes	1 mL	2.3 mL	140
rhombic dodecahedra			130
octahedra		0.049 M 2.3 mL	140

Fig. S1 Schematic illustration of the $CsPbBr_3$ crystal synthesis process and the reagent amounts used. Again the rate of bringing the frozen solid back to room temperature is critical to size control of rhombic dodecahedra. For 59 nm rhombic dodecahedra, melting took about 2 min, and around 5 and 10 min to make 80 and 168 nm rhombic dodecahedra, respectively.

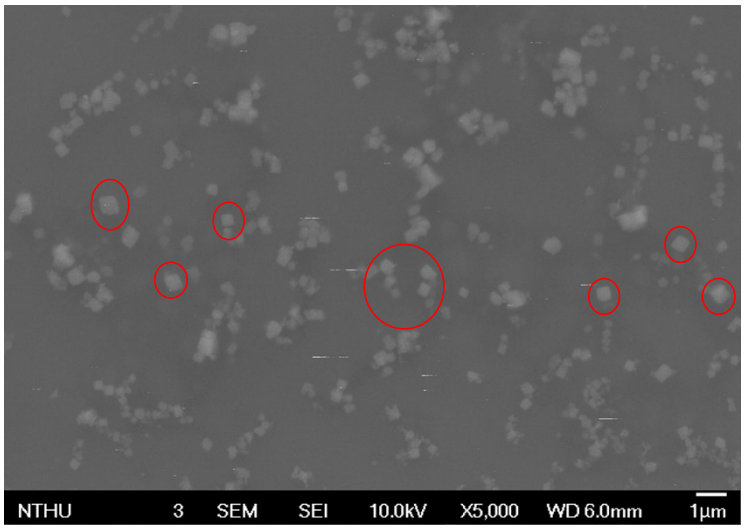


Fig. S2 Additional SEM images showing the formation of $CsPbBr_3$ octahedra. The circles indicate examples of octahedra.

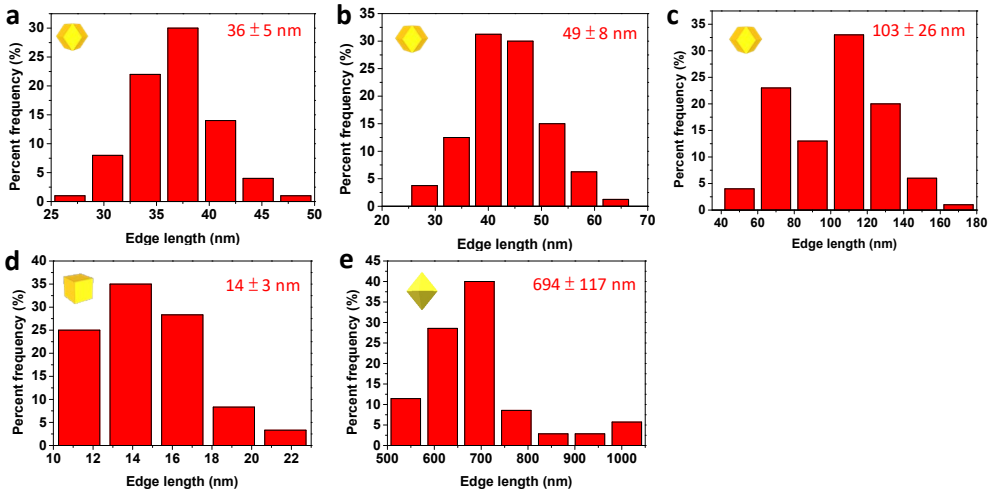


Fig. S3 Size distribution histograms of the synthesized (a) 59, (b) 80, and (c) 160 nm $CsPbBr_3$ rhombic dodecahedra, (d) nanocubes, and (e) octahedra. From average edge length, the average opposite face length of rhombic dodecahedra is determined. The opposite corner distance of octahedra can be obtained from the average edge length.

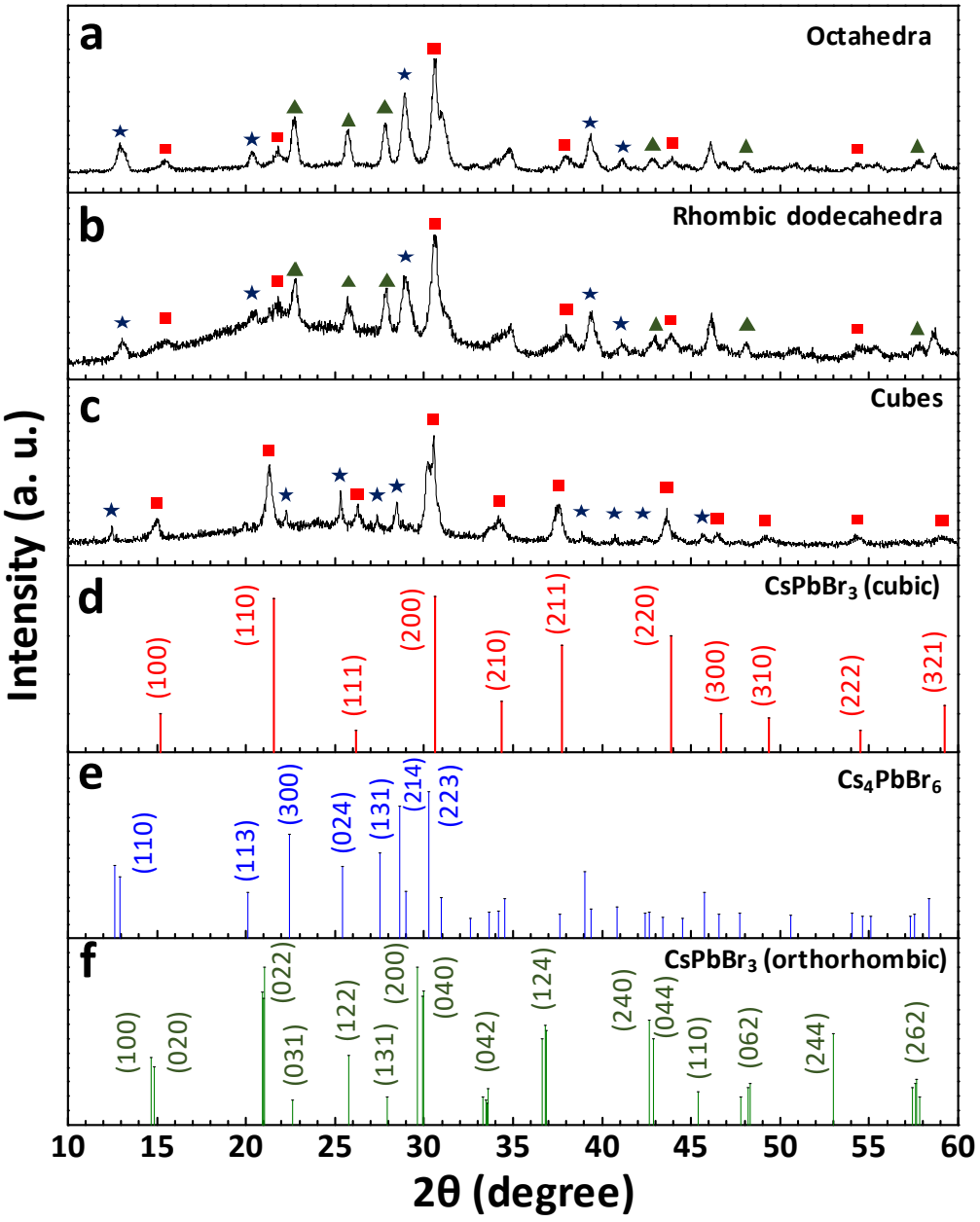


Fig. S4 XRD patterns of the synthesized $CsPbBr_3$ (a) octahedra, (b) 59 nm rhombic dodecahedra, (c) nanocubes, (d) standard cubic $CsPbBr_3$ (squares), (e) Cs_4PbBr_6 (stars), and (f) orthorhombic $CsPbBr_3$ (triangles). A few peaks do not exactly match to any of the possible crystal phases.

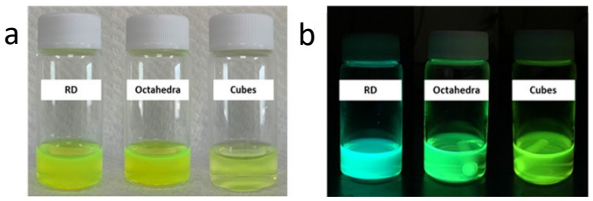


Fig. S5 Photographs of the $CsPbBr_3$ particle solutions (a) under room light and (b) illuminated by UV light.

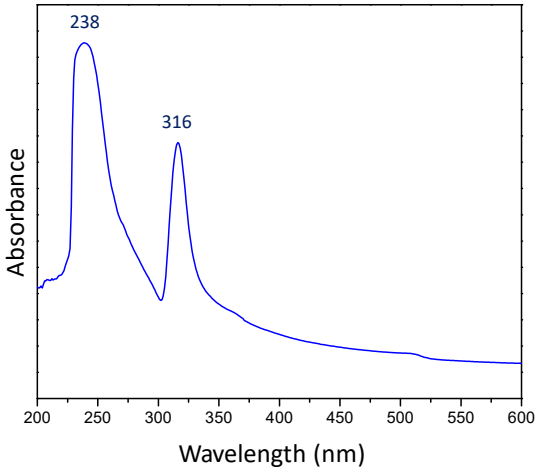


Fig. S6 Room-temperature UV–vis spectrum of the prepared $CsPbBr_3$ nanocubes in hexane. Significant bands from Cs_4PbBr_6 are present. The $CsBrBr_3$ absorption band is also observable.

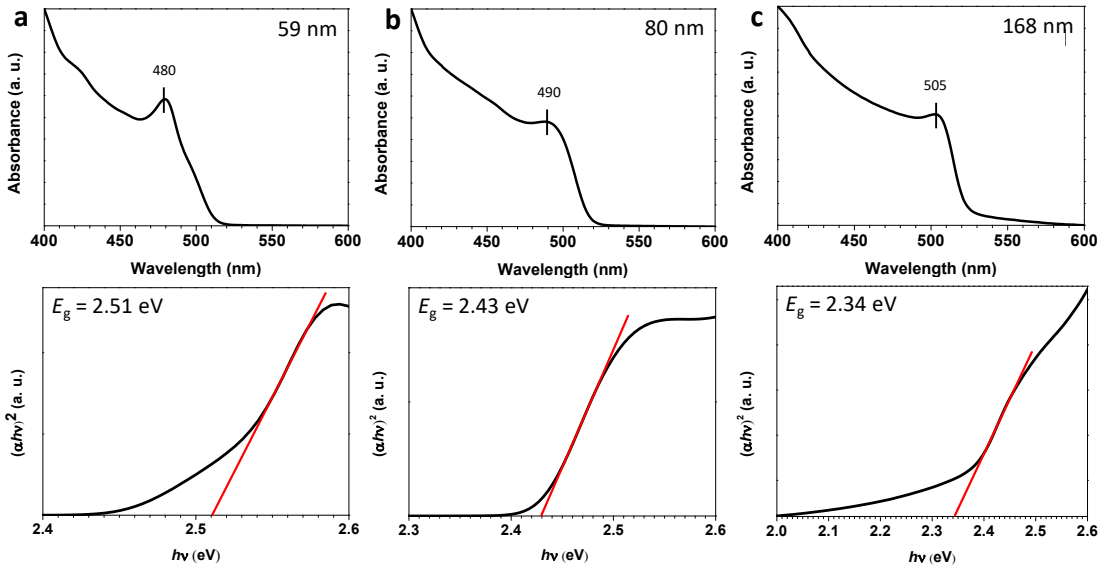


Fig. S7 (a–c) Room-temperature UV–vis absorption spectra of the synthesized $CsPbBr_3$ rhombic dodecahedra with tunable sizes dispersed in hexane. (d–f) Tauc plots for rhombic dodecahedra with opposite face lengths of 59, 80, and 168 nm.

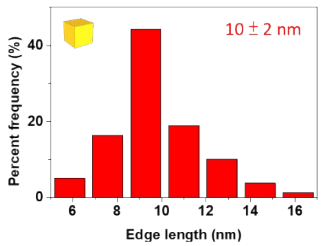


Fig. S8 Size distribution histograms of the prepared $CsPbI_3$ nanocubes.

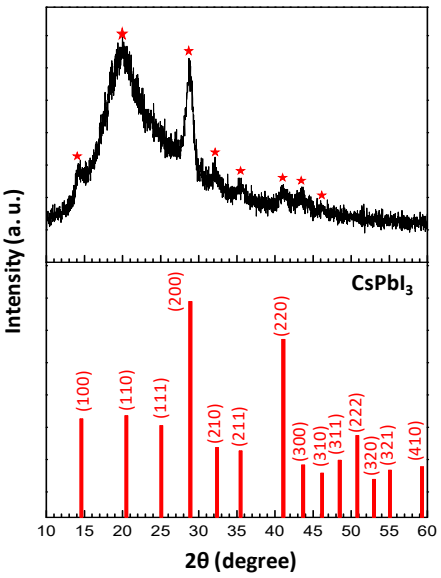


Fig. S9 XRD pattern of the synthesized $CsPbI_3$ nanocubes. Standard XRD pattern is also shown.

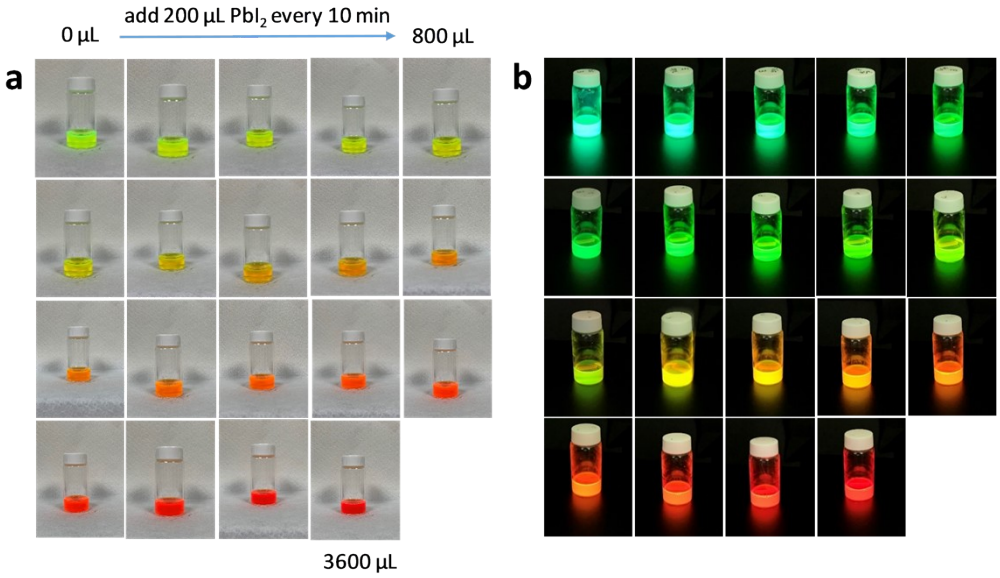


Fig. S10 Digital photographs of the $CsPbBr_3$ solution undergoing anion exchange reaction under (a) room light and (b) UV lamp illumination (λ = 365 nm). From left to right and top to bottom, the photos show the solution color changes with sequential addition of 200 μL of PbI_2 solution every 10 min.

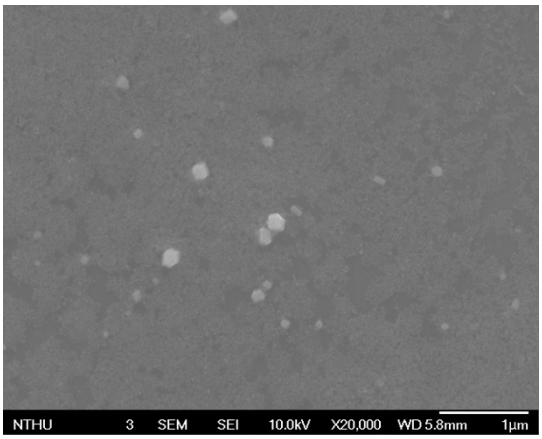


Fig. S11 SEM image of the synthesized 130 nm $CsPbBr_3$ rhombic dodecahedra.

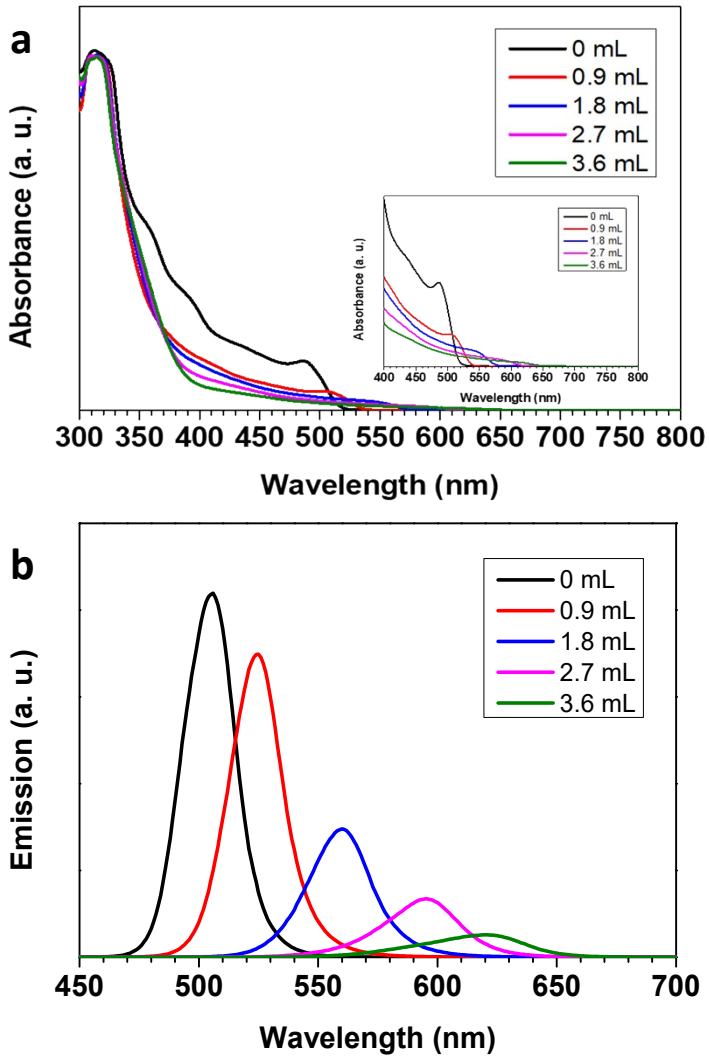


Fig. S12 (a) Room-temperature UV–vis absorption spectra of the anion-exchanged $CsPbBr_3$ rhombic dodecahedra with addition of different volumes of PbI_2 solution. Inset shows an expanded view. (b) Photoluminescence spectra of the same solutions.

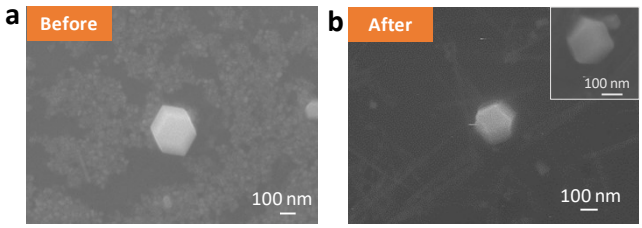


Fig. S13 SEM images of (a) a $CsPbBr_3$ rhombic dodecahedron and (b) the converted $CsPbI_3$ rhombic dodecahedron.

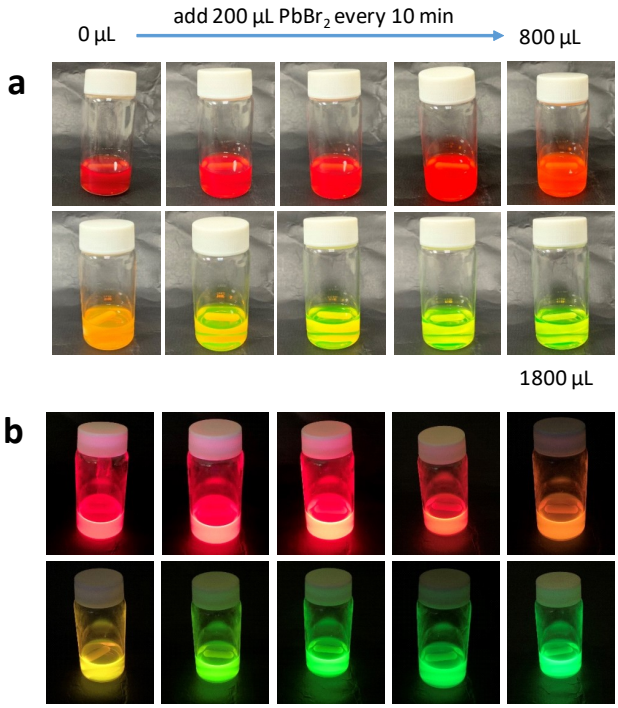


Fig. S14 Digital photographs of the $CsPbI_3$ solution undergoing anion exchange reaction under (a) room light and (b) UV lamp illumination. From left to right, the photos show the solution color changes with sequential addition of 200 μL of $PbBr_2$ solution every 10 min.

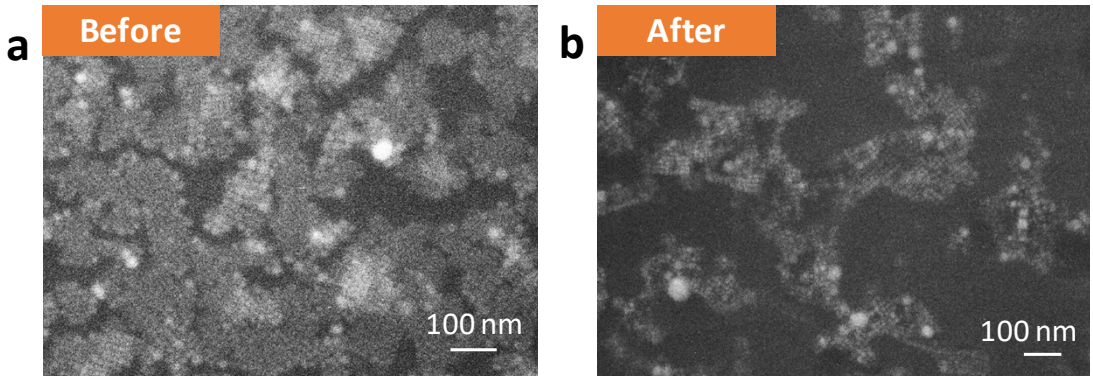


Fig. S15 (a) SEM image of $CsPbI_3$ nanocubes and (b) the converted $CsPbBr_3$ nanocubes.