Supporting Information

High performance of PbSe/PbS core/shell quantum dot heterojunction solar cells: Short circuit current enhancement without loss of open circuit voltage by shell thickness control

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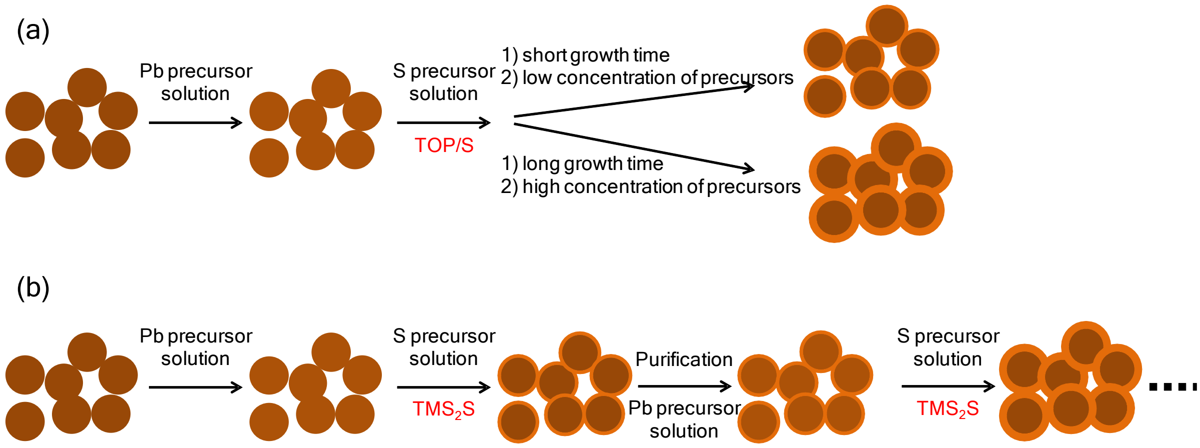
Scheme S1. Synthesis scheme for PbSe/PbS core/shell CQDs of (a) conventional method, (b) our methods.



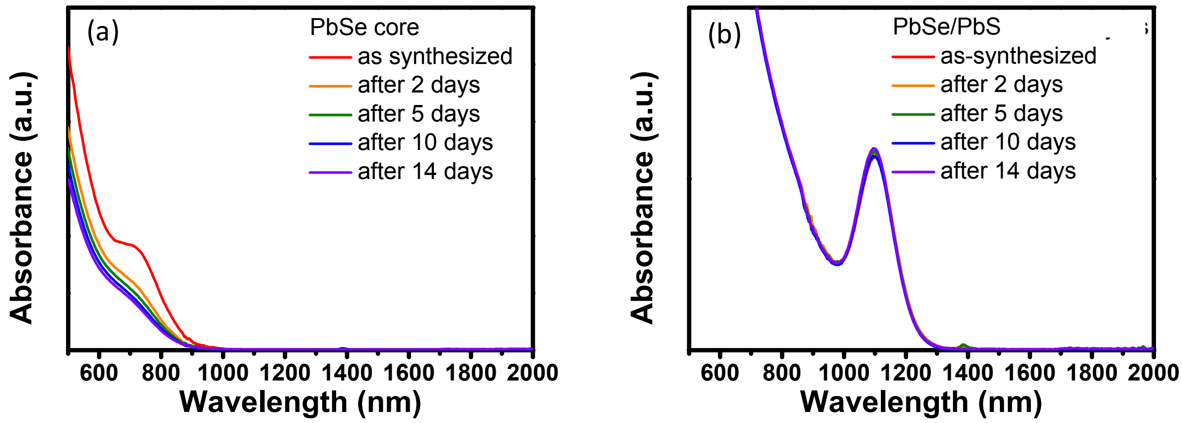


Figure S1. Absorption spectra of PbSe core and PbSe/PbS core/shell with 1.3-nm-thick PbS shell depending on elapsed time.

Table S1. Performance parameters of PbSe/PbS core/shell CQD solar cells depending on PbS shell thickness under AM 1.5G illumination. Results are averaged with standard deviation across over 12 cells.

	V_{OC} (V)	J_{SC} (mA/cm^2)	FF (%)	η (%)
Core	0.46±0.02	6.4±0.43	30±0.4	0.9±0.8
0.5 nm PbS shell	0.46±0.01	9.3±0.03	40±1.2	1.7±0.06
0.9 nm PbS shell	0.46±0.01	11.8±0.8	49±3.8	3.0±0.43
1.3 nm PbS shell	0.43±0.01	12.3±1.2	37±1.2	1.5±0.20

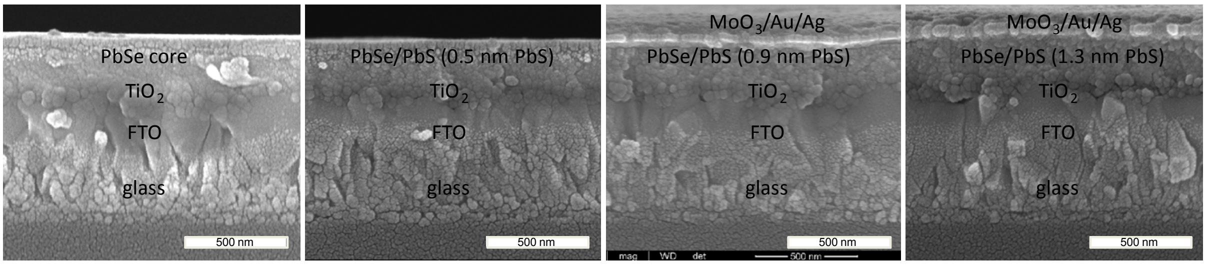


Figure S2. Cross-sectional SEM images of PbSe/PbS core/shell with 0 to 1.3 nm PbS shell thickness. The scale bar represents 500 nm.

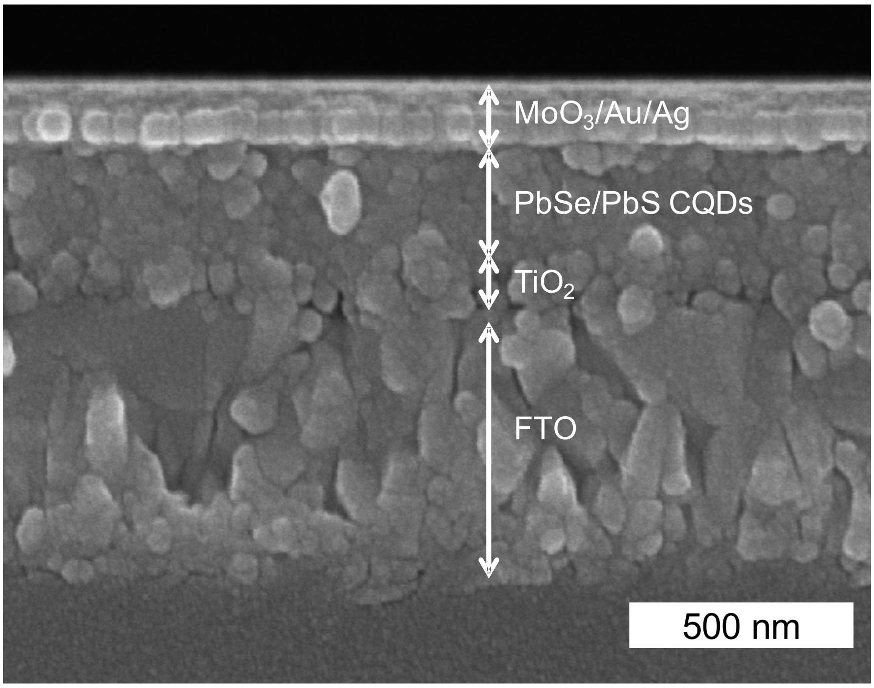


Figure S3. Cross-sectional SEM images of PbSe/PbS core/shell with 0.9-nm-thick PbS shell after further optimization. The scale bar represents 500 nm.

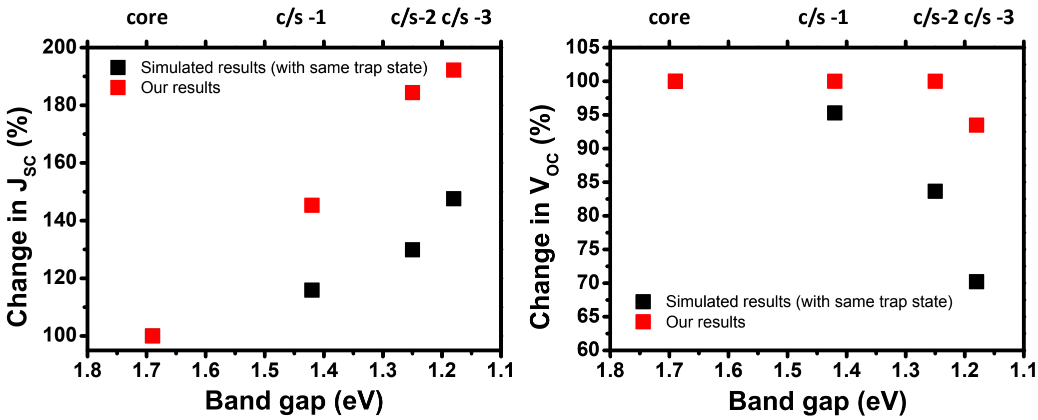


Figure S4. Simulated and experimented changes in the J_{SC} and V_{OC} in solar cell as a function of CQD band gap.

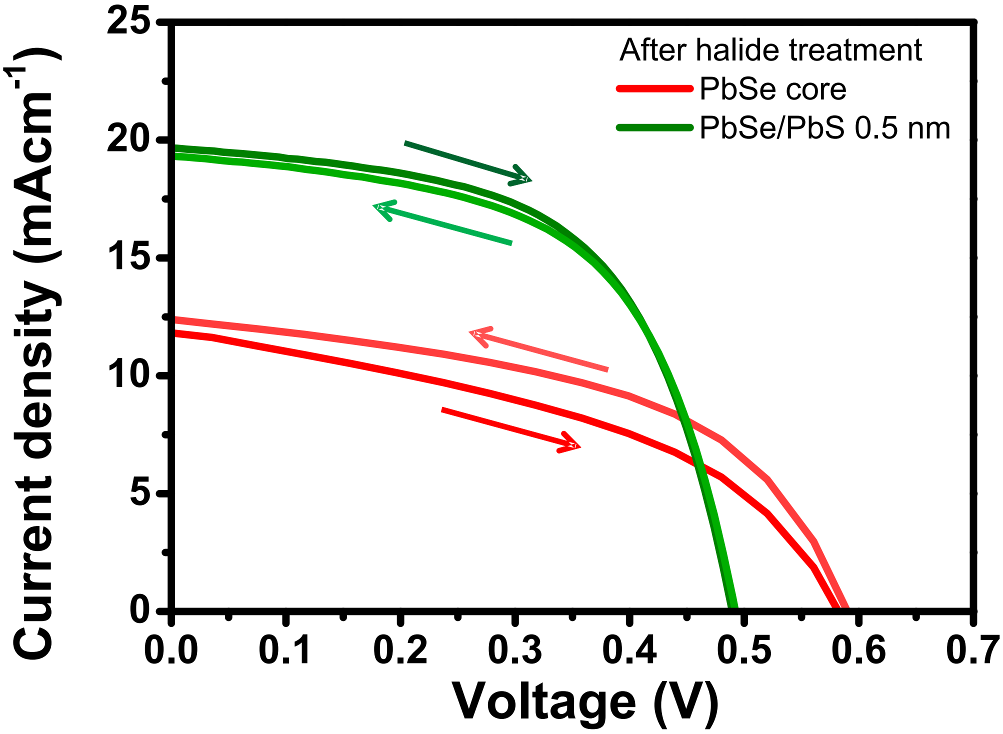


Figure S5. j-v curves of solar cells with PbSe core and PbSe/PbS core/shell-0.5nm after halide treatment.

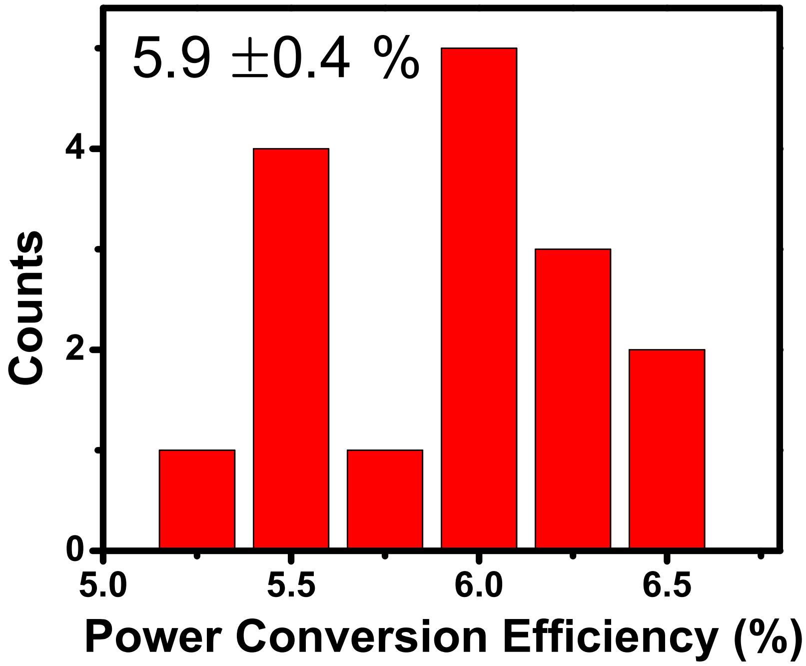


Figure S6. Histogram of power conversion efficiencies for 16 separate devices under AM 1.5G illumination conditions of the PbSe/PbS core/shell CQD heterojunction solar cells with 0.9-nm-thick PbS shell.