Supporting Information for

High Performance Core-shell Structured Photovoltaic Device Based on PbS Quantum Dots and Silicon Nanopillar Arrays

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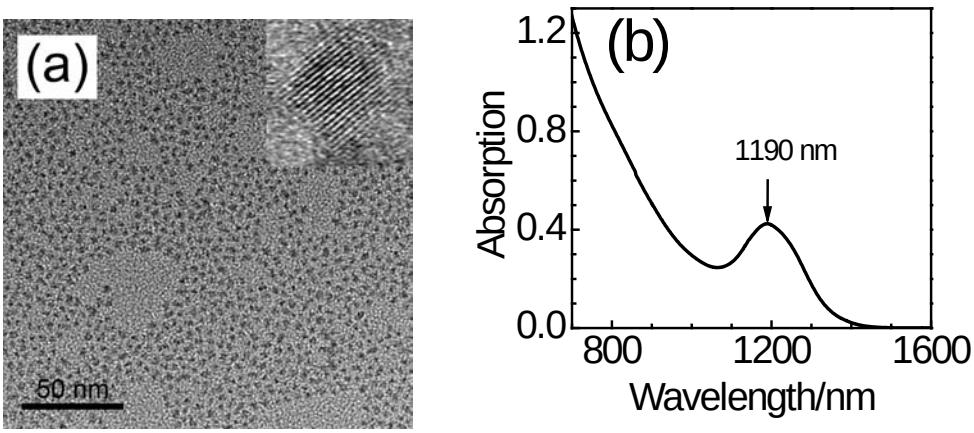

Figure S1. (a) TEM image and (b) absorption spectrum of as-synthesized PbS QDs.

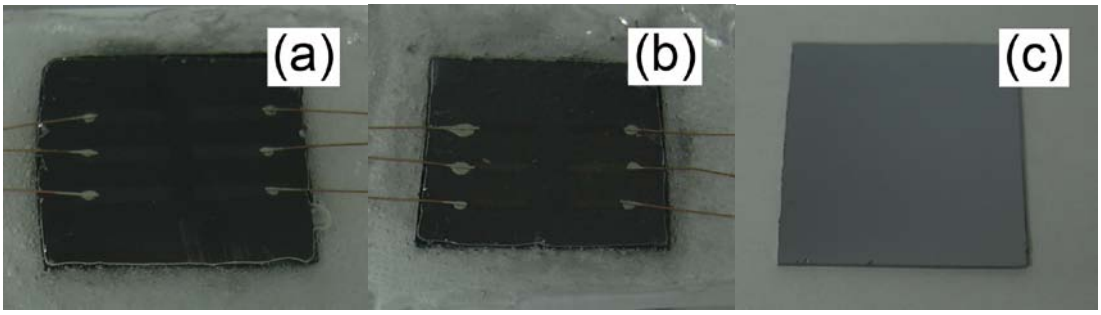

Figure S2. Photos of devices made of (a) dense SiNPs and (b) PCl_5 treated sparse SiNPs. Planar silicon is also shown in (c) for comparison.

Table S1 Electric output characteristics of PbS/silicon nanopillar arrays with different PCl_5 treatment duration. The concentration of PbS is 15 mg/mL in octane.

Devices	V_{oc} (V)	J_{sc} ($mAcm^{-2}$)	FF	PCE (%)
W/O	0.338	0.30	0.358	0.036
1 hour	0.395	17.5	0.510	3.53
2 hours	0.428	26.4	0.520	5.89
3 hours	0.423	26.0	0.532	5.86
4 hours	0.432	25.1	0.532	5.76
5 hours	0.438	24.5	0.529	5.68

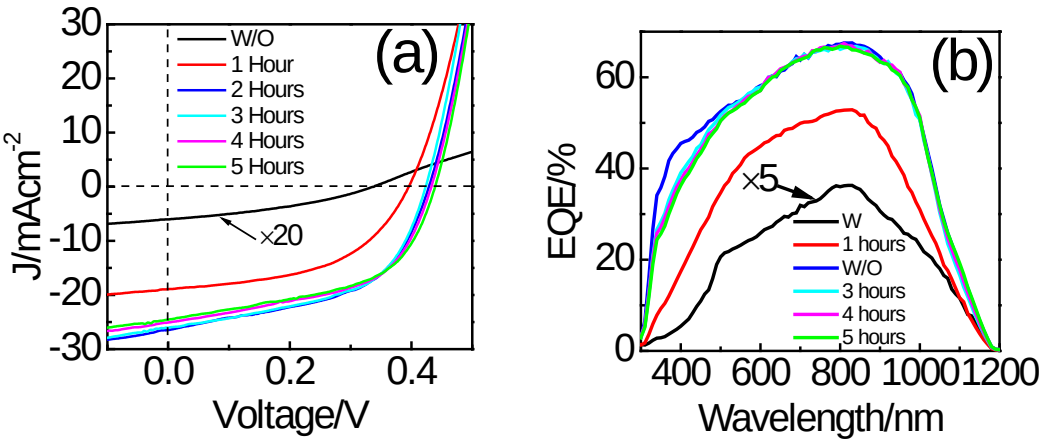

Figure S3. IV curve of devices with different PCl_5 treatment duration under AM 1.5 G light illumination.

Table S2 Electric output characteristics of PbS/SiNPs with different thickness of PbS. PbS solution with various concentration was used to fabricate the films. The SiNPs are etched in PCl_5 for 2 hour.

Devices	V_{oc} (V)	J_{sc} (mA/cm^2)	FF	PCE (%)
0mg*	0.050	12.5	0.344	0.215
1.25mg	0.251	17.5	0.534	2.35
2.5mg	0.290	21.4	0.576	3.58
5mg	0.306	27.3	0.546	4.57
10mg	0.326	25.4	0.515	4.26
20mg	0.448	29.2	0.499	6.52
40mg	0.400	24.0	0.476	4.56
80mg	0.286	5.63	0.437	0.799

*: without PbS layer.

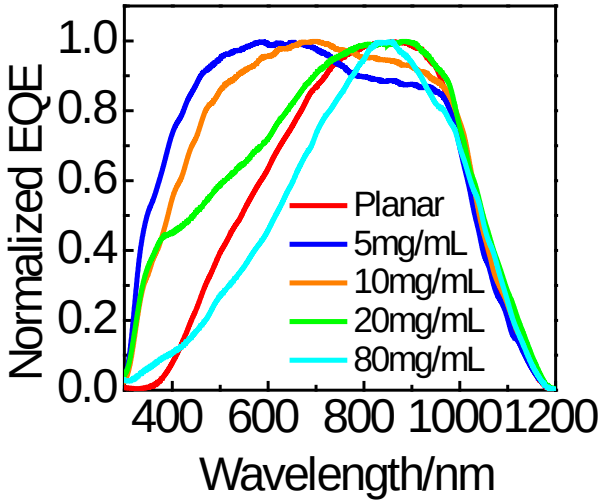

Figure S4. Normalized external quantum efficiency of device based on PbS/silicon nanopillar array made by different thickness of PbS. PbS solutions with different concentration was used to fabricate the films.

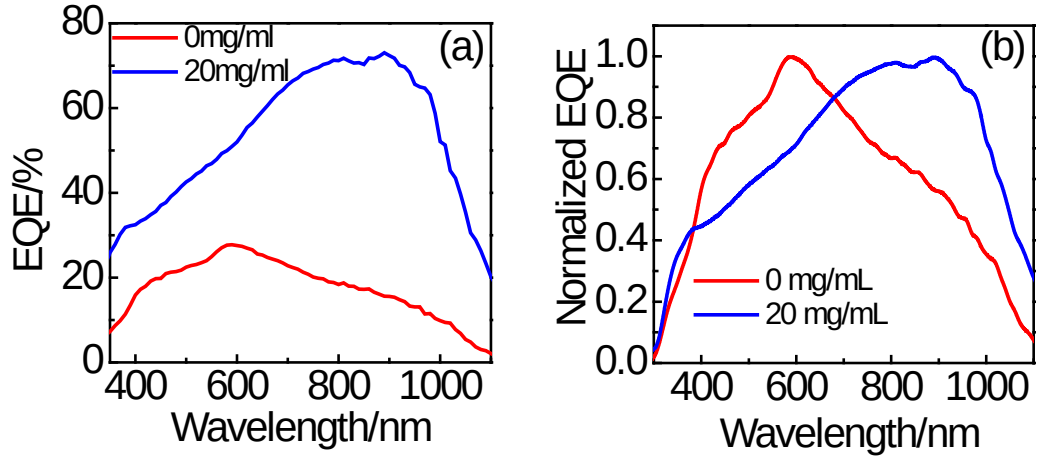

Figure S5. (a) External quantum efficiency spectra dependent on wavelength of devices with (20 mg/mL PbS coating) and without (0 mg/mL) PbS layer. (b) The normalized EQE spectra.