Electronic Supplementary Material (ESI) for Nanoscale

Supporting Materials

6.5% Efficient Perovskite Quantum-Dot-Sensitized Solar Cell

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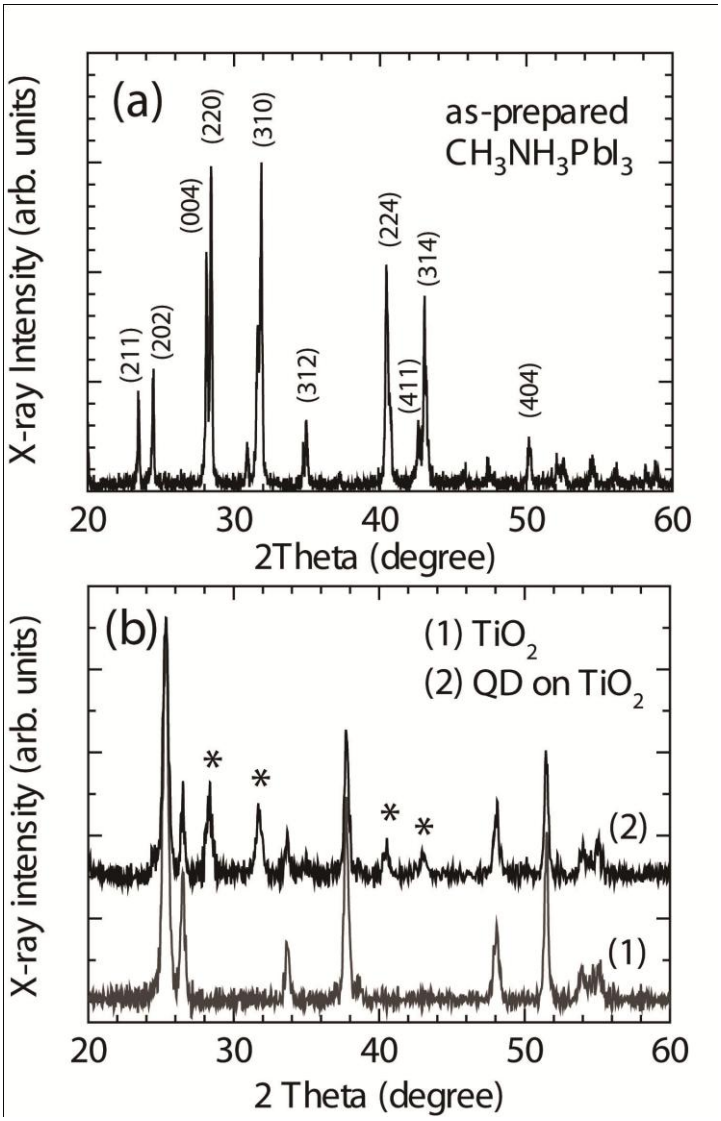

Figure S1. X-ray diffraction patterns for (a) as-prepared $CH_3NH_3PbI_3$ powder (not deposited on TiO_2 surface) and (b) nanoparticulate TiO_2 film on FTO glass with and without deposition of $CH_3NH_3PbI_3$ on TiO_2 surface. The powder in (a) was obtained by drying the γ-butyrolactone solution contained CH_3NH_3I and PbI_2.

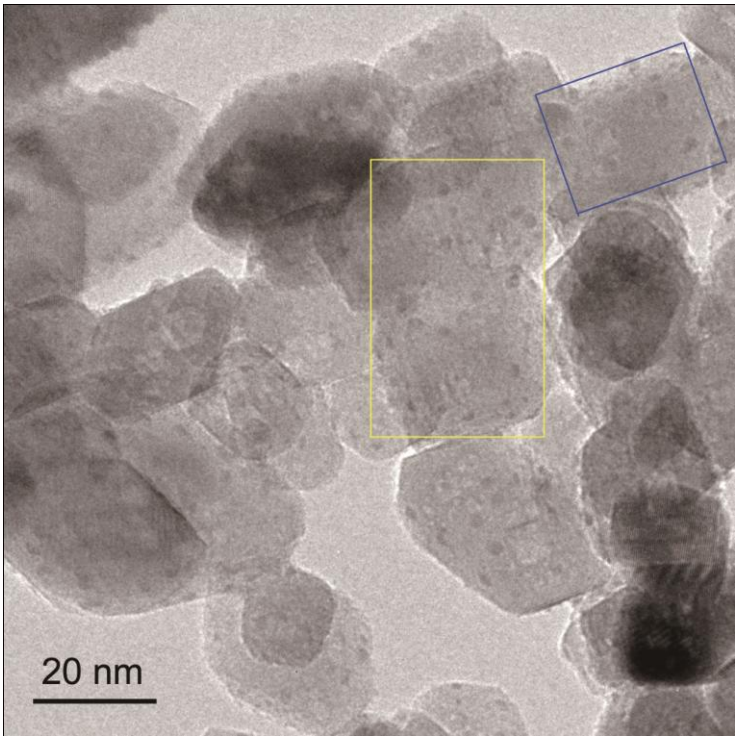

Figure S2. Number of perovskite QDs in a Gaussian box (yellow rectangle) with dimension of 28.07 nm × 44.91 nm was estimated to be 40/1260.6 nm^2, corresponding to $3.2\times10^4/\mu m^2$, and $3.8\times10^4/\mu m^2$ for a Gaussian box (blue rectangle) with dimension of 19.6 nm × 20 nm. Sample for TEM image was prepared using a 40.26 wt% perovskite precursor solution.

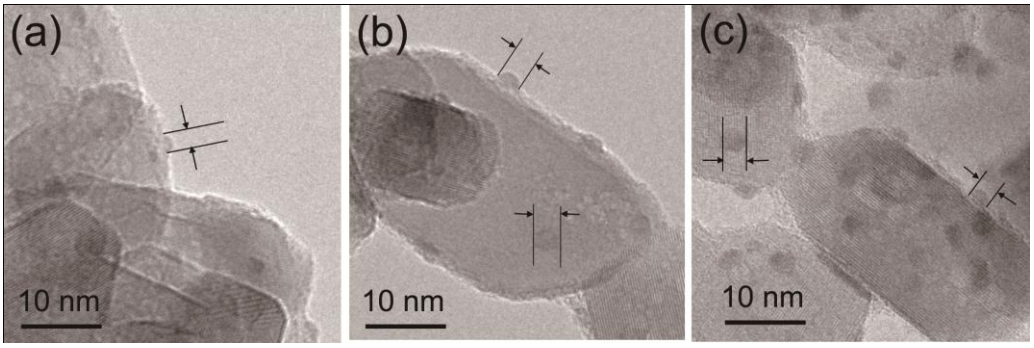

Figure S3. TEM images of the perovskite $(CH_3NH_3)PbI_3$ QD-deposited TiO_2 particles from (a) 10.05 wt%, (b) 21.13 wt% and (c) 30.18 wt% equimolar mixture of CH_3NH_3I and PbI_2 in γ-butyrolactone. Average diameter of perovskite QD was determined to be about 2.5 nm, regardless of perovskite precursor solution concentration.

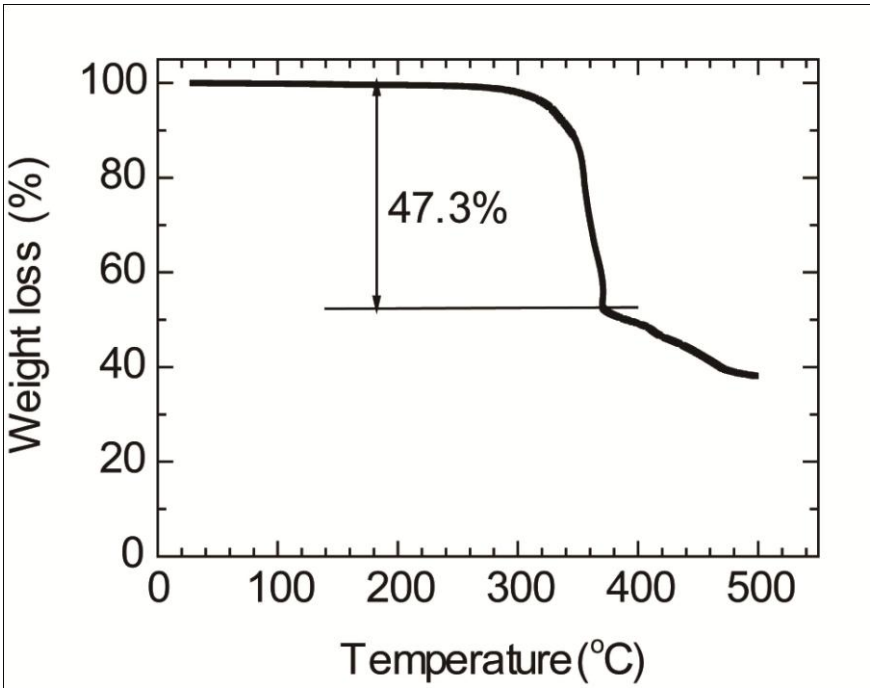

Figure S4. Weight loss as a function of temperature for the powdered perovskite $(CH_3NH_3)PbI_3$. Thermogravimetric analysis was performed at rate of 10 ^oC/min under air atmosphere

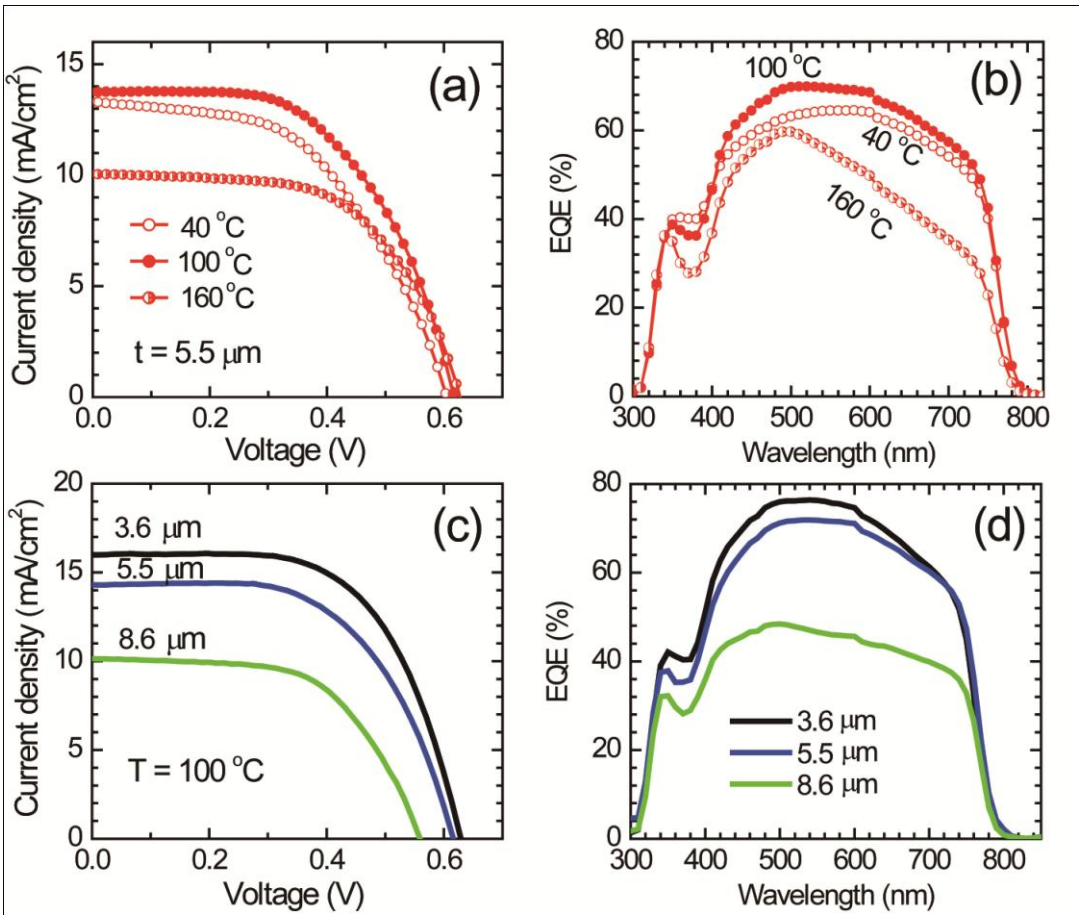

Figure S5. Effects of post annealing temperature (a and b) and film thickness (c and d) on J-V curves and EQE spectra of the perovskite $(CH_3NH_3)PbI_3$ QD-sensitized solar cells. For annealing temperature experiments, TiO_2 films with thickness of about 5.5 μm were used and a 40.26 wt% of the equimolar mixture of CH_3NH_3I and PbI_2 in γ-butyrolactone was used for perovskite QD deposition. For film thickness experiments, QD-sensitized TiO_2 films were annealed at 100 °C and a 41.22 wt% of the equimolar mixture of CH_3NH_3I and PbI_2 in γ-butyrolactone was used for perovskite QD deposition. J-V measurement was performed at AM 1.5 G one sun illumination (100 mW/cm^2).

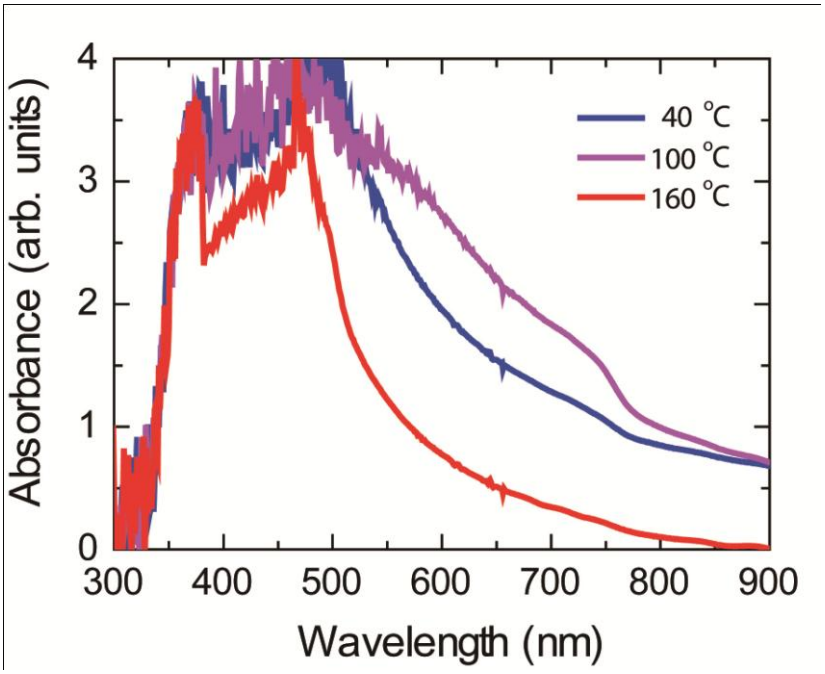

Figure S6. Absorption spectra of perovskite OD deposited TiO_2 films depending on post-annealing temperature.