

*Supporting Information for*

# **A Novel CdS Hole-Blocking Layer for Photo-Stable Perovskite Solar Cells**

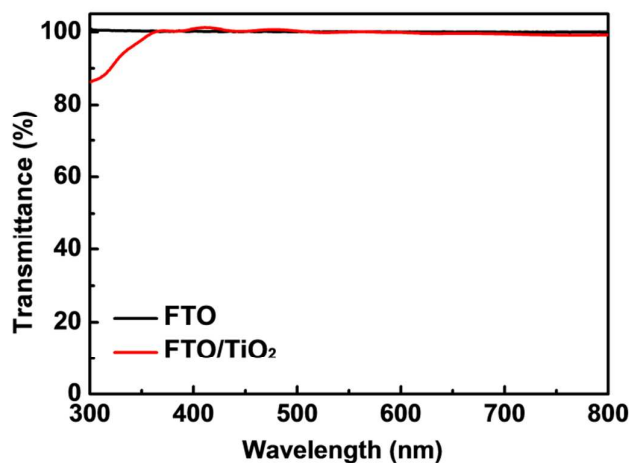
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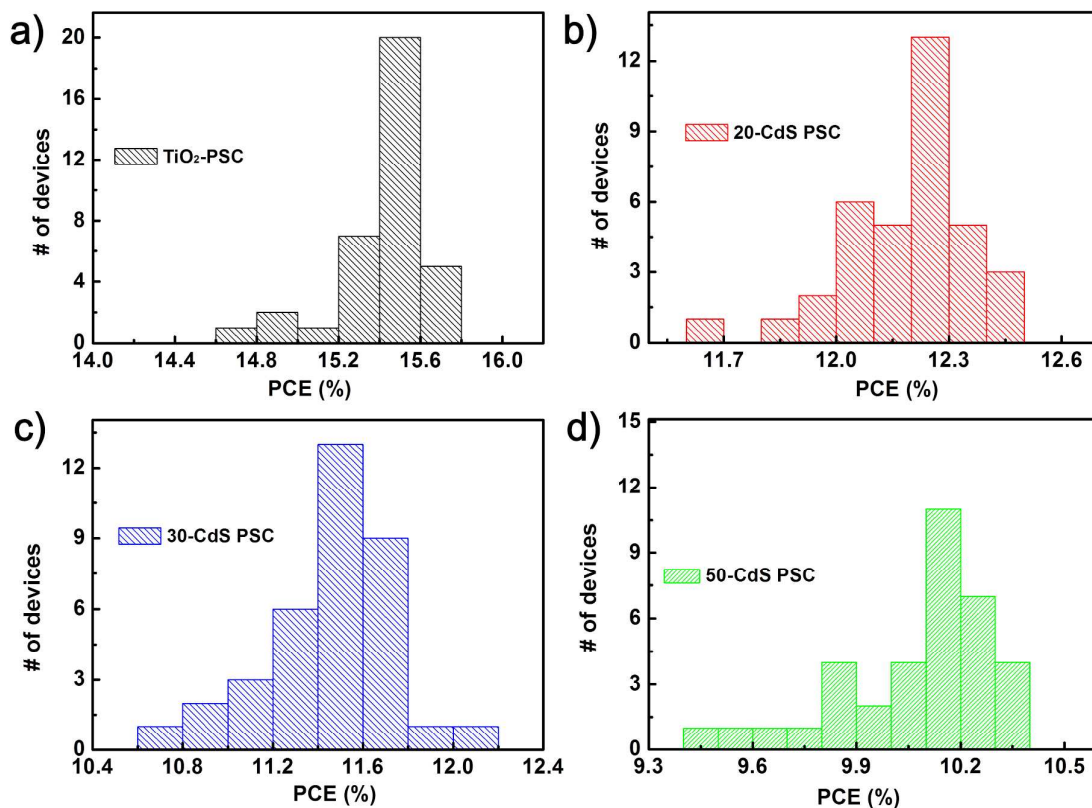
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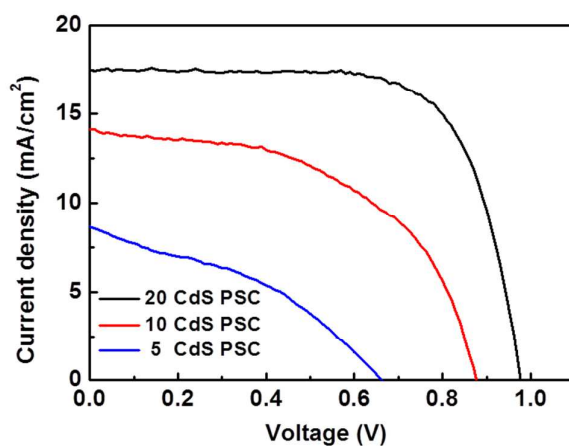
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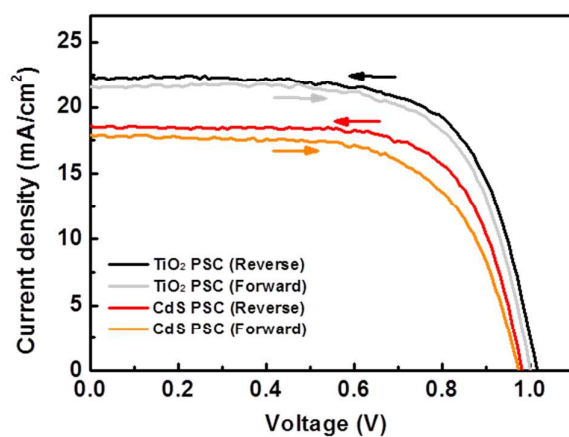
**Figure S1.** Optical Transmittances of the bare FTO glass substrate and the compact TiO<sub>2</sub>/FTO substrate.



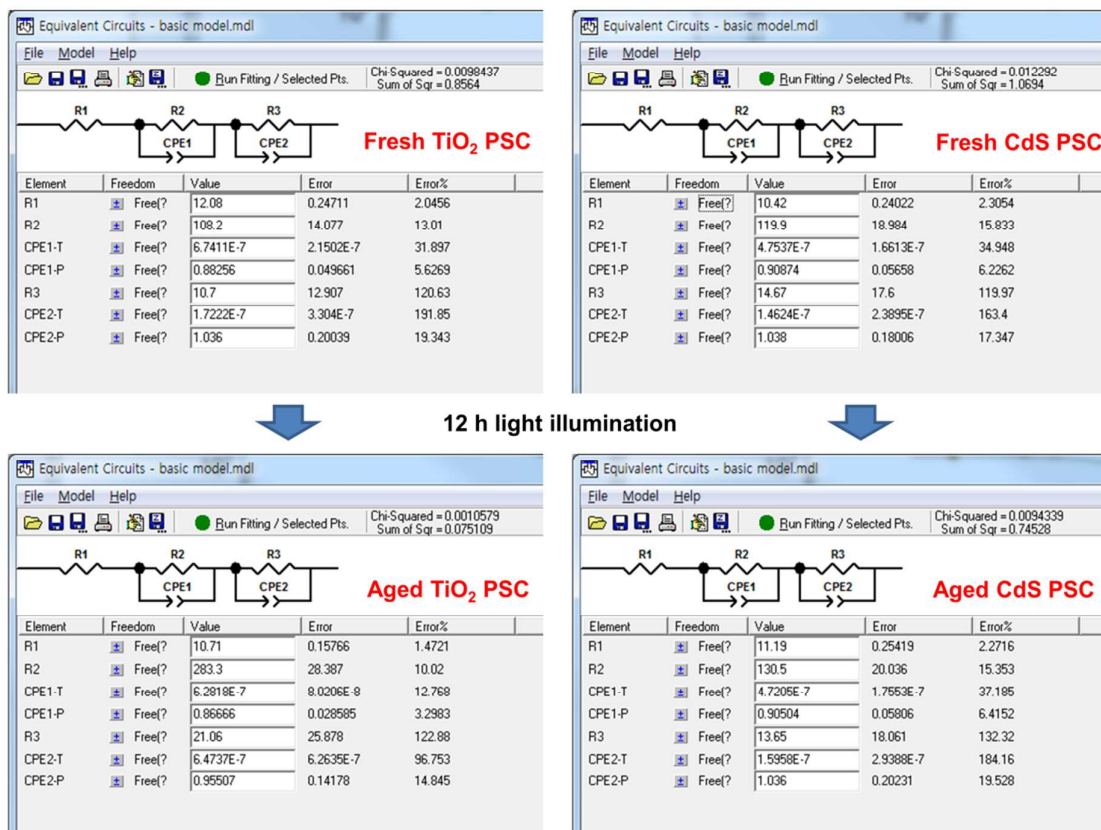
**Figure S2.** Distribution histograms of the PCEs of the TiO<sub>2</sub> PSC and various CdS PSCs, observed from the identical 36 devices of each type. (a) TiO<sub>2</sub> PSC, (b) 20 nm CdS PSC, (c) 30 CdS PSC, and (d) 50 CdS PSC.



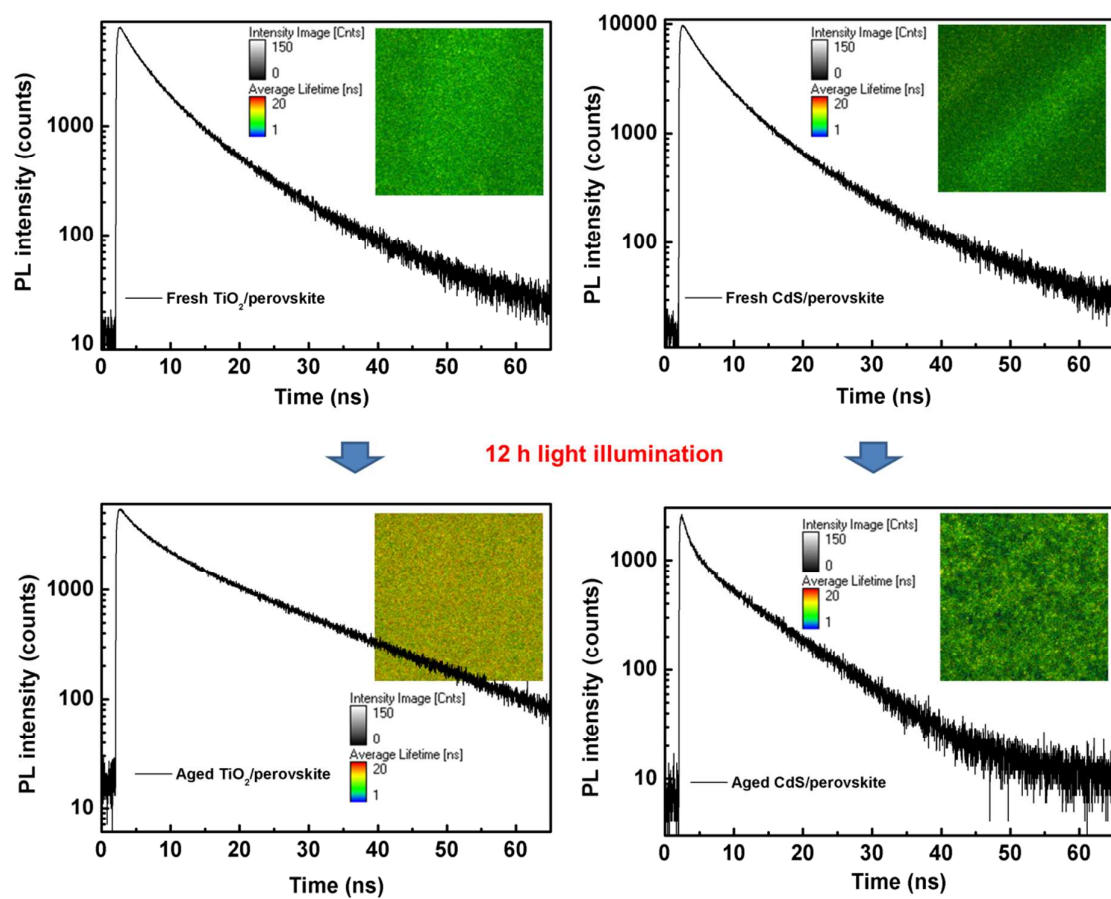
**Figure S3.** J-V measurement results of the CdS-PSCs adopting the thin CdS HBLs with the thicknesses of 20 nm, 10 nm, and 5 nm. Too thin CdS layers are considered to be not appropriate for the device fabrication.



**Figure S4.** J-V curves of the TiO<sub>2</sub> PSC and 20-CdS PSC depending on the scan direction, measured to investigate the hysteresis effects of PSCs. The both PSCs demonstrated insignificant degrees of hysteresis.



**Figure S5.** Equivalent circuit models used for the data-fitting of the EIS measurement result, and corresponding results of the data-fitting. The resistance denoted “R2” is the dominant resistance, which was interpreted as the charge transfer resistance at the HBL/perovskite interface.



**Figure S6.** Raw graphs of the time-resolved PL decay measurement without the data-fitting. Insets visualize the average PL lifetimes of each result.