Supporting Information

Flower-Like MoS_2 Nanocrystals: A Powerful Sorbent of Li^+ in Spiro-OMeTAD Layer for Highly Efficient and Stable Perovskite Solar Cells

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Keywords: Perovskite solar cells; Device stability; Flower-like MoS_2; Ionic igration

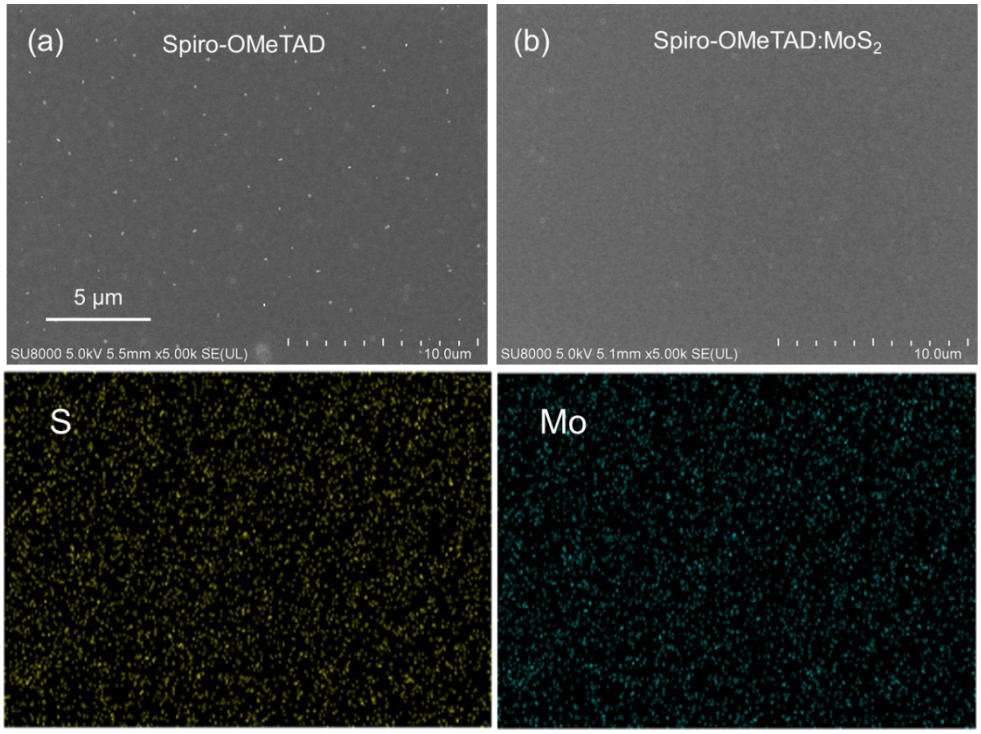

Figure S1. The SEM images of Spiro-OMeTAD and Spiro-OMeTAD: MoS_2 (0.6 wt%) films deposited on $CH_3NH_3PbI_3$ layer. The bottom two figures are the and the S and Mo elements mappings in Spiro-OMeTAD: MoS_2 (0.6 wt%) film.

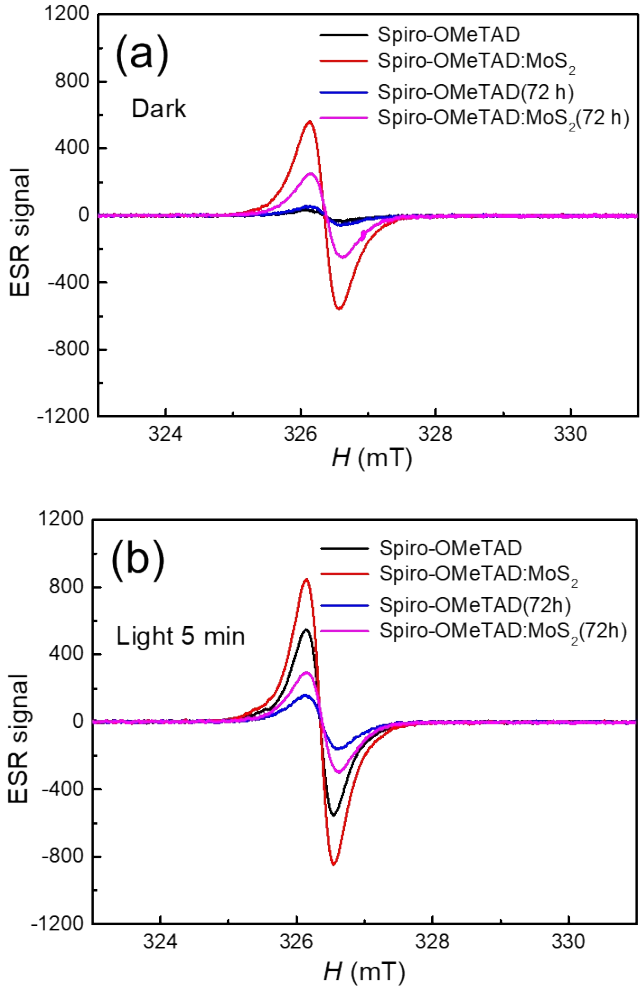

Figure S2. ESR spectroscopy of as-prepared and aged (72 h) Spiro-OMeTAD and Spiro-OMeTAD: MoS_2 films under (a) dark and (b) lighting for min.

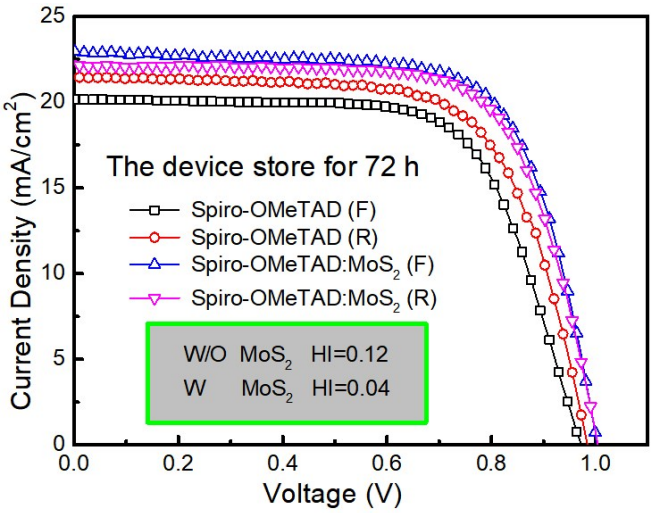

Figure S3. *J-V* characteristics of aged (72 h) perovskite solar cells under forward and reverse scanning directions. Inset are the calculated values of current hysteresis (HI).

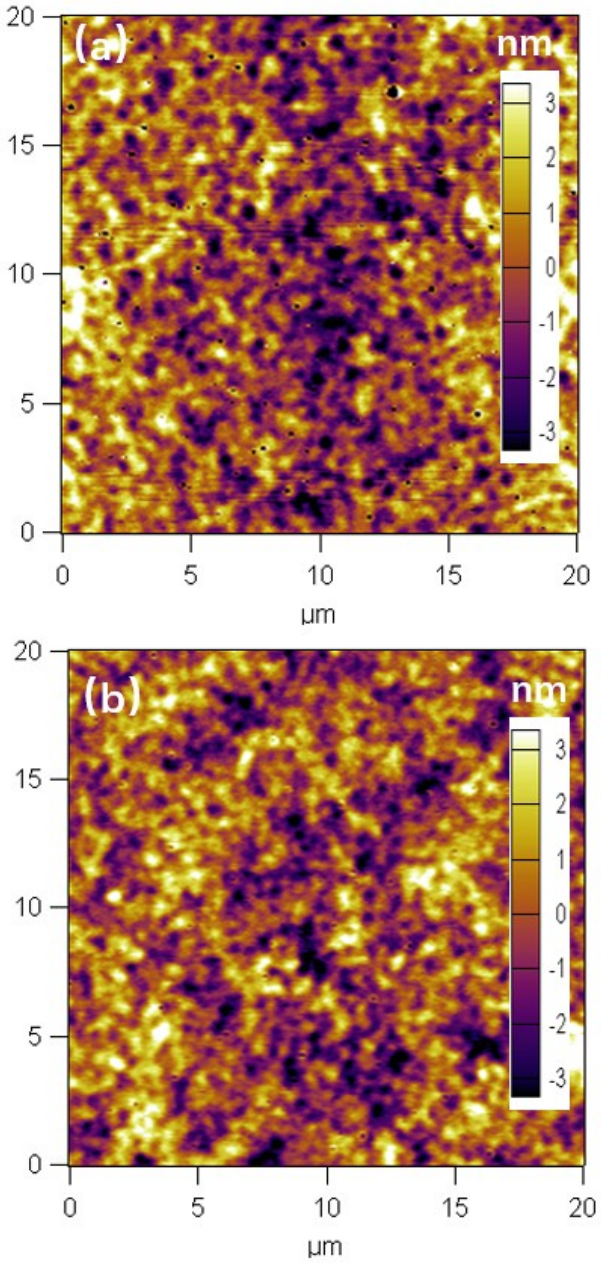

Figure S4. AFM images of aged (72 h in air) (a) Spiro-OMeTAD and (b) Spiro-OMeTAD:MoS_2 (0.6 wt%) films deposited on $CH_3NH_3PbI_3$ layer.

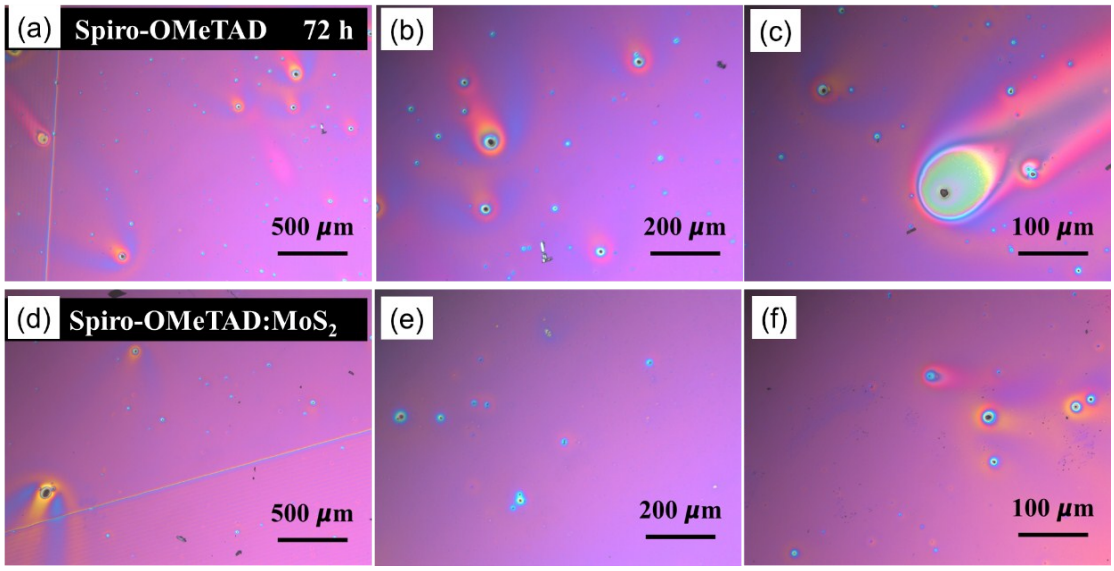

Figure S5. Polarized optical microscope images of (a)-(c) Spiro-OMeTAD and (d)-(f) Spiro-OMeTAD:MoS_2 (0.6 wt%) films deposited on $CH_3NH_3PbI_3$ layer.

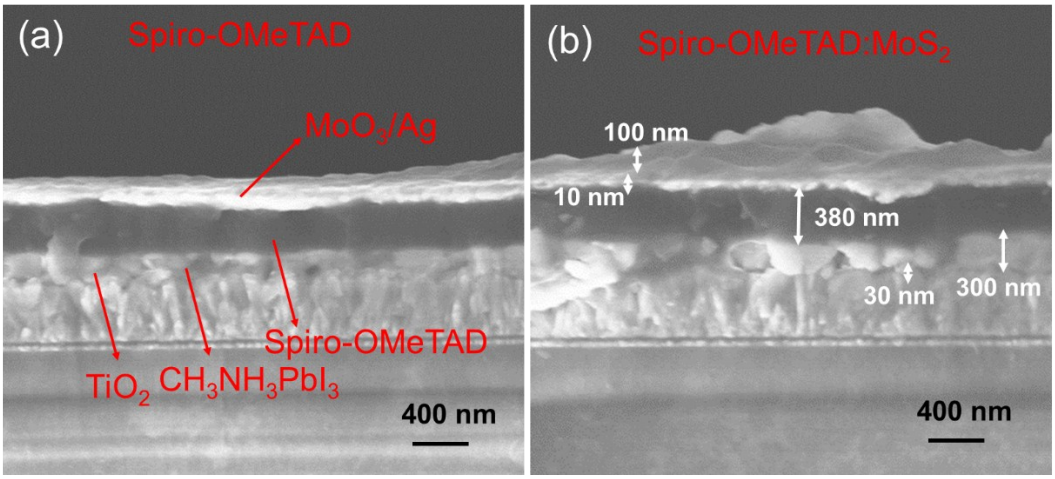

Figure S6. The cross-section SEM images of Spiro-OMeTAD and Spiro-OMeTAD :MoS_2 based devices.

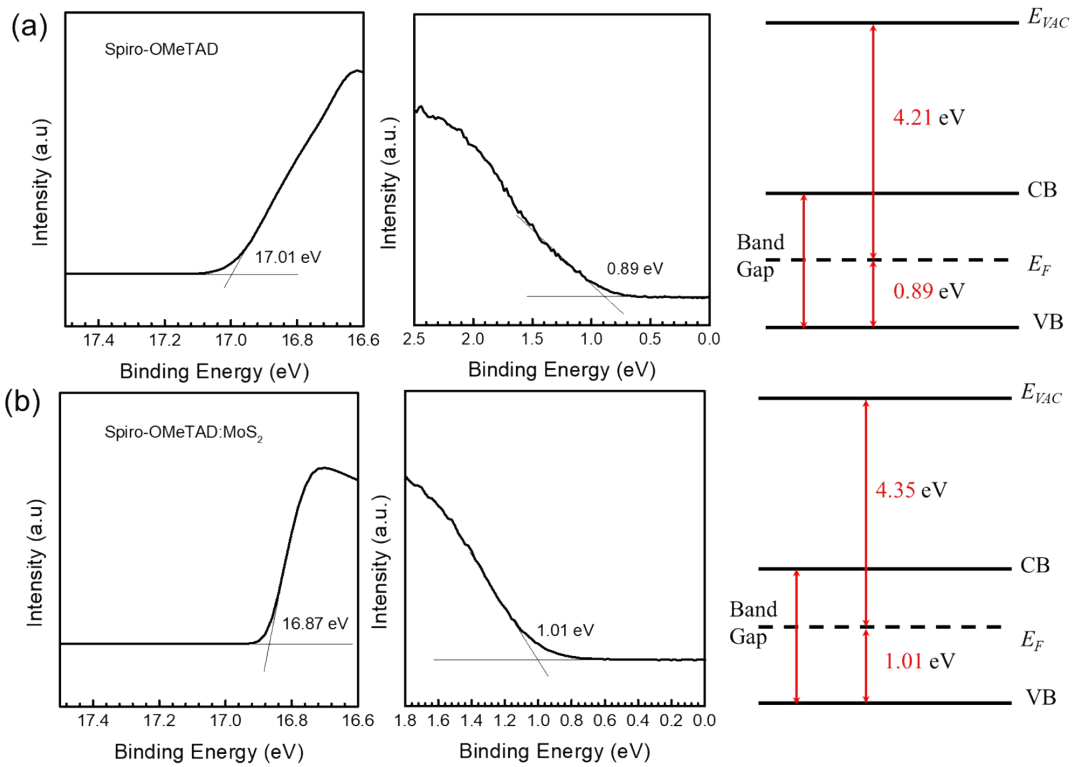

Figure S7. The UPS images of Spiro-OMeTAD and Spiro-OMeTAD:MoS_2 (0.6 wt%) films and energy-level diagram of the corresponding layer.

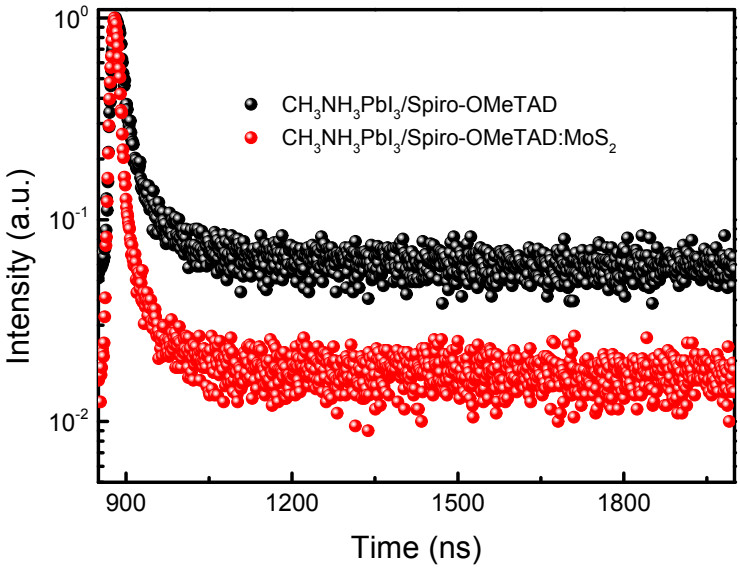

Figure S8. The plots of time-resolved photoluminescence for glass/$CH_3NH_3PbI_3$/Spiro-OMeTAD and Spiro-OMeTAD:MoS_2 (0.6 wt%).

The PL decay time and amplitudes are fitted using exponential equation, where A_i is the decay amplitude, τ_i is the decay time, and K is a constant for the baseline offset.

$$f(t) = \sum_i A_i \exp\left(-\frac{t}{\tau_i}\right) + K$$

The average lifetime (τ_{ave}) is estimated using equation as follows.

$$\tau_{ave} = \frac{\sum A_i \tau_i^2}{\sum A_i \tau_i}$$

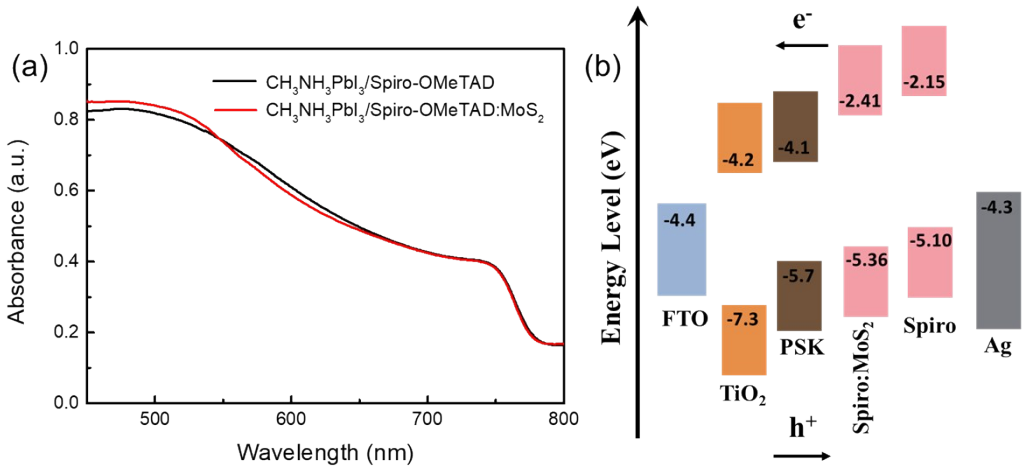

Figure S9. (a) Absorption spectra of $CH_3NH_3PbI_3$/Spiro-OMeTAD and $CH_3NH_3PbI_3$/Spiro-OMeTAD:MoS_2 films. (b) Energy-level diagram of the corresponding materials.