Supplementary Information

Thermally Evaporated Two-Dimensional SnS as an Efficient and Stable Electron Collection Interlayer for Inverted Planar Perovskite Solar Cells

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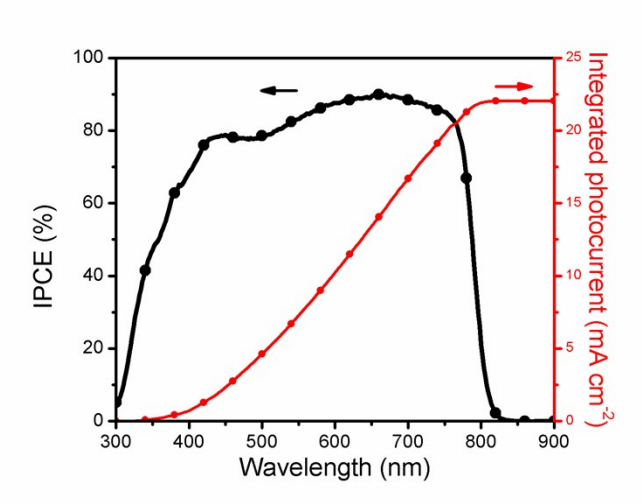


Figure S1. Incident photon-to-current conversion efficiency (IPCE) and integrated photocurrent density of ITO/PTAA/perovskite/C_{60}/SnS (3nm)/Ag.

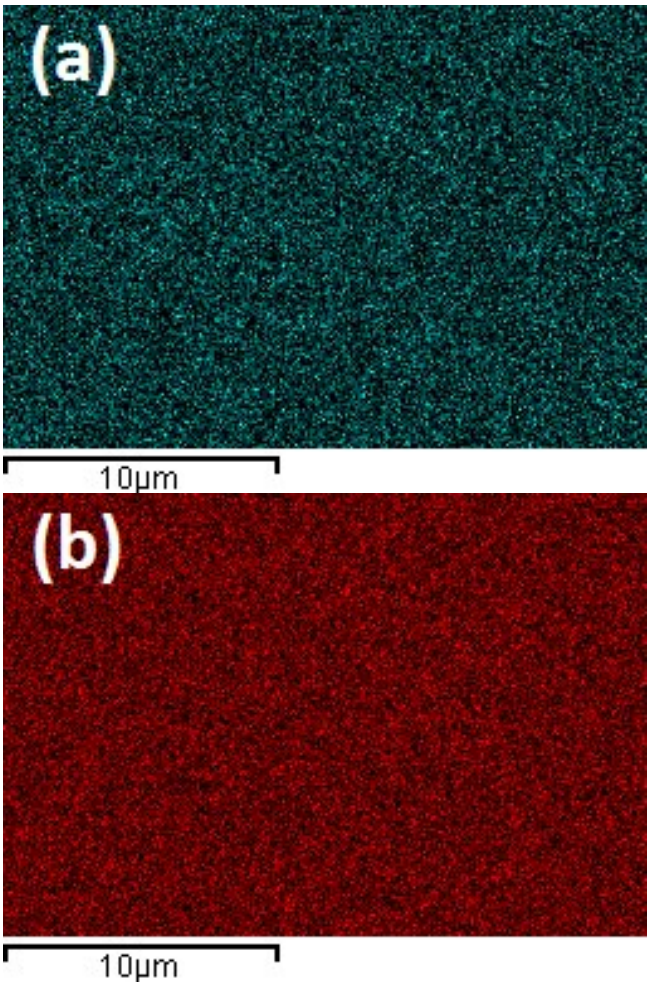
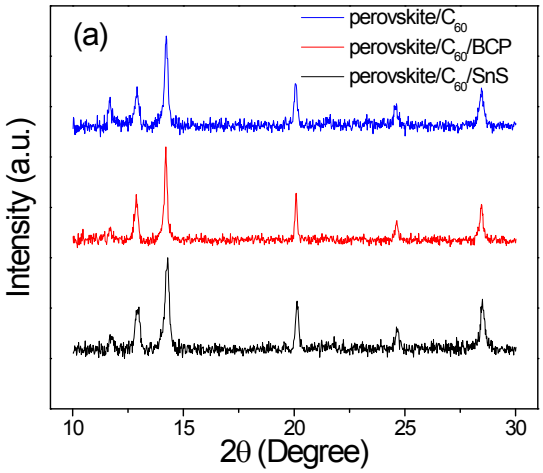
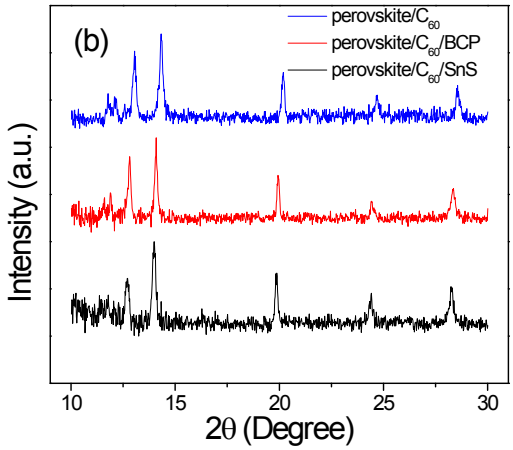
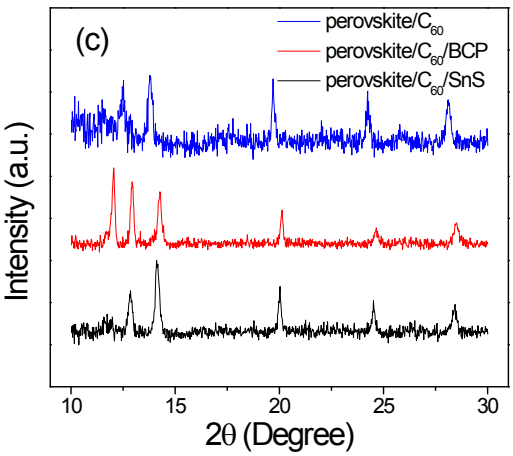


Figure S2. SEM mapping for (a) Sn and (b) S of SnS film coated on ITO/PTAA/perovskite/C60.


(a)
perovskite/C60
perovskite/C60/BCP
perovskite/C60/SnS
Intensity (a.u.)
10
15
20
25
30
2θ (Degree)


(b)
perovskite/C60
perovskite/C60/BCP
perovskite/C60/SnS
Intensity (a.u.)
10
15
20
25
30
2θ (Degree)


(c)
perovskite/C60
perovskite/C60/BCP
perovskite/C60/SnS
Intensity (a.u.)
10
15
20
25
30
2θ (Degree)

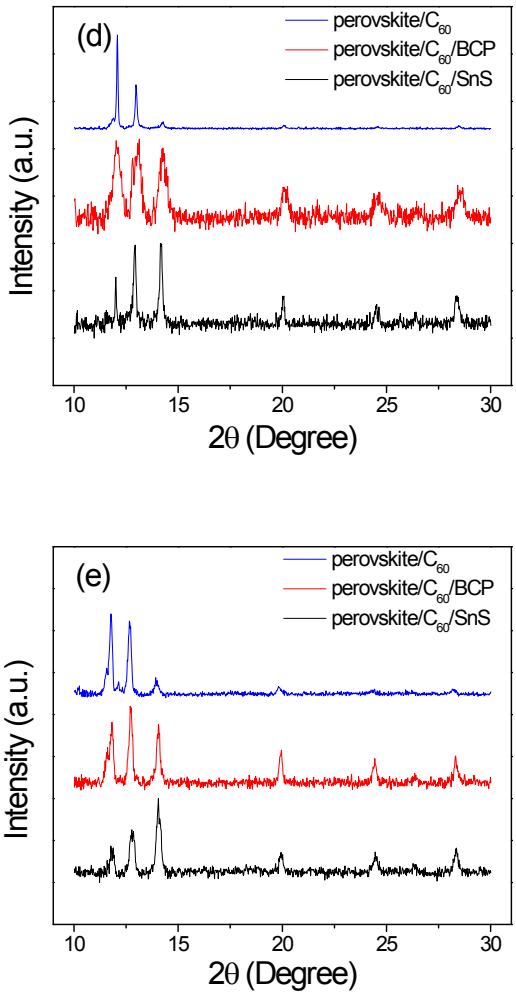


Figure S3. X-ray diffraction patterns of 45nm C_{60}, 45nm C_{60}/8nm BCP and 45nm C_{60}/3nm SnS coated perovskite thin films kept in the air at (a) day 0, (b) day 1, (c) day 2, (d) day 5 and (e) day 10.

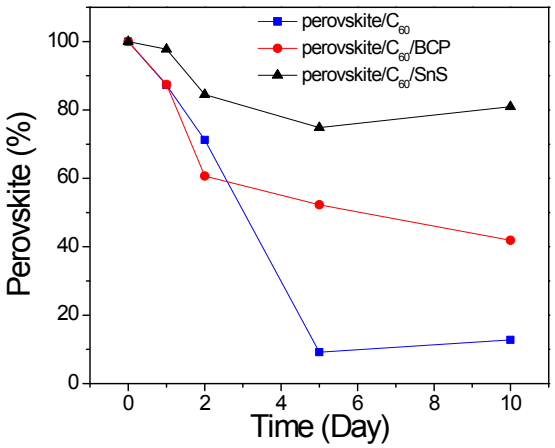


Figure S4. Ratio of undegraded perovskite derived from XRD spectra for 45nm C_{60}, 45nm C_{60}/3nm SnS and 45nm C_{60}/8nm BCP coated perovskite thin films, using the formula based on intensities *(I)* on Figure S3, $Perovskite\ (\%) = 100\ x\ \frac{I_{14.2^\circ}}{(I_{14.2^\circ}+I_{12.9^\circ}+I_{10.6^\circ})}$ taking day 0 as a baseline.

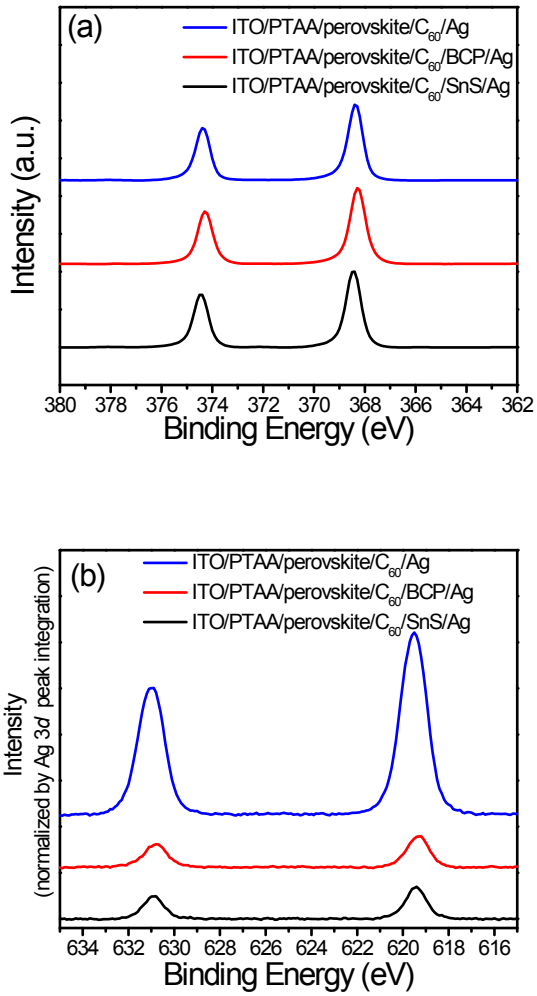


Figure S5. (a) Ag 3d region and (b) I 3d region of XPS spectra for ITO/PTAA/perovskite/C_{60}/Ag, ITO/PTAA/perovskite/C_{60}/BCP(8nm)/Ag and ITO/PTAA/perovskite/C_{60}/SnS(3nm)/Ag devices that are aged for 5 days at ambient atmosphere under the light.

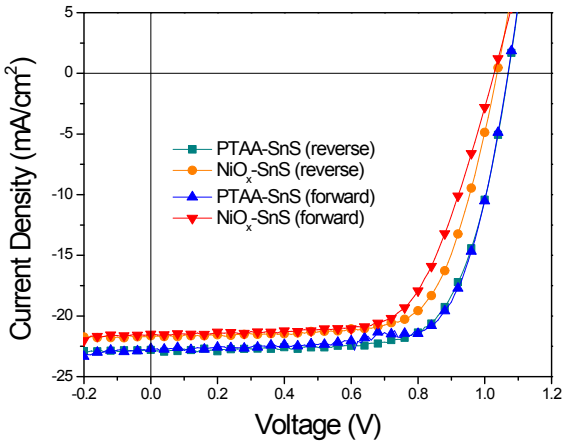


Figure S6. *J–V* characteristics of PSCs, ITO/NiO_x/perovskite/C_{60}/SnS/Ag and ITO/PTAA/perovskite/C_{60}/SnS/Ag under AM1.5G illumination (100 mW cm^{-2}) for reverse and forward scan directions.