Sb_2Se_3/CdSe Thin Film Photocathode for Efficient Hydrogen Production

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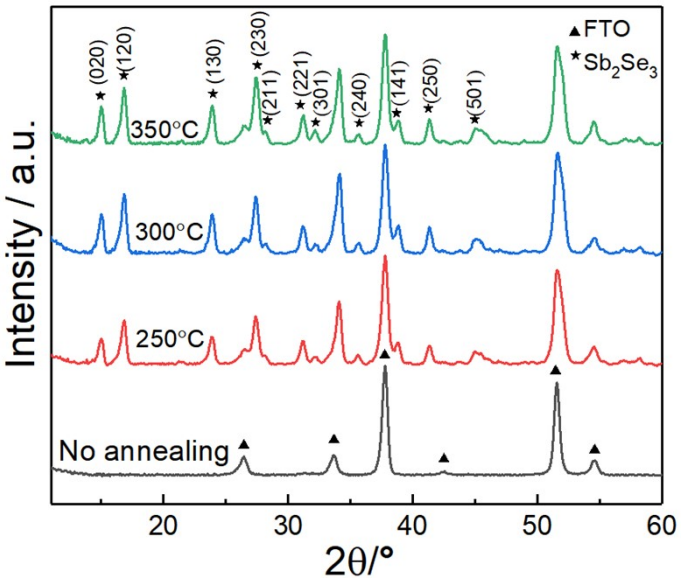

Fig. S1. XRD patterns of Sb_2Se_3 annealed at different temperatures.

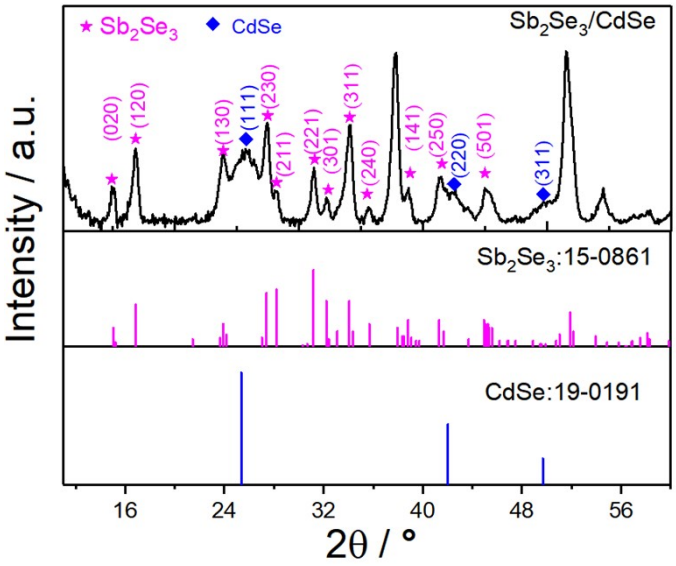

Fig. S2. XRD patterns of the Sb_2Se_3/CdSe sample.

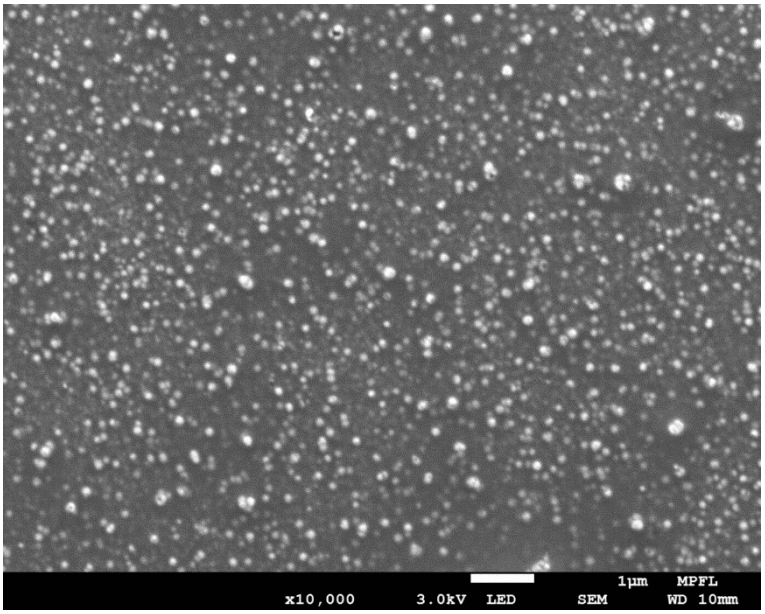

Fig. S3. SEM image of CdSe on FTO.

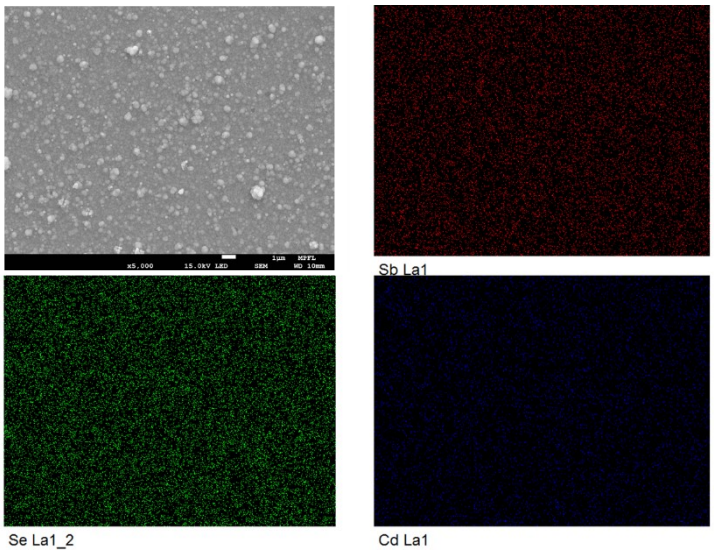

Fig. S4. EDS image of Sb_2Se_3/CdSe sample.

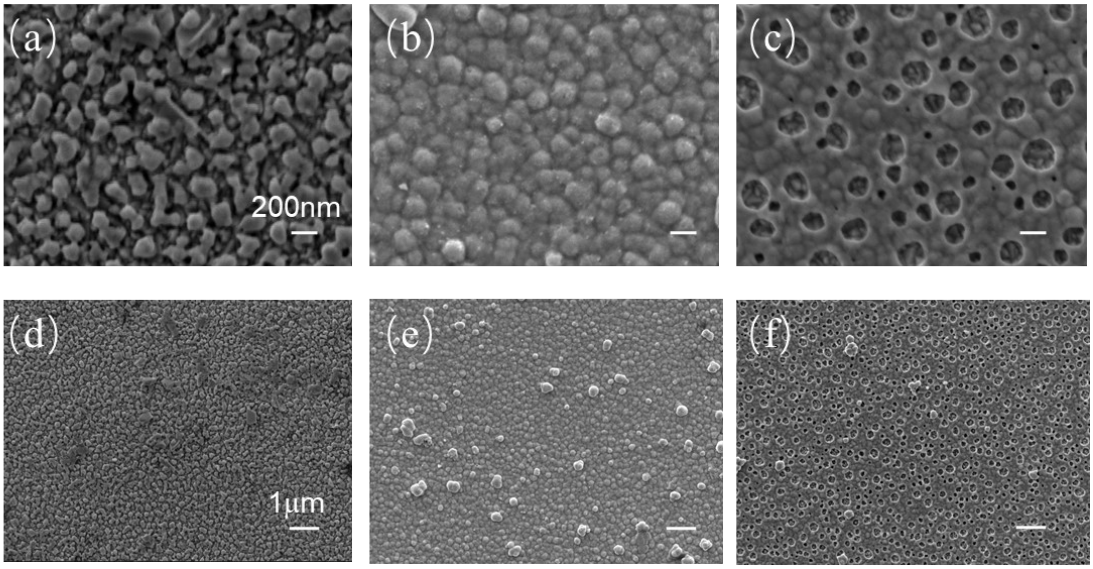

Fig. S5. SEM images of Sb_2Se_3 annealed at (a,d) 200, (b,e) 250, and (c,f) 300 ℃ under an Ar atmosphere.

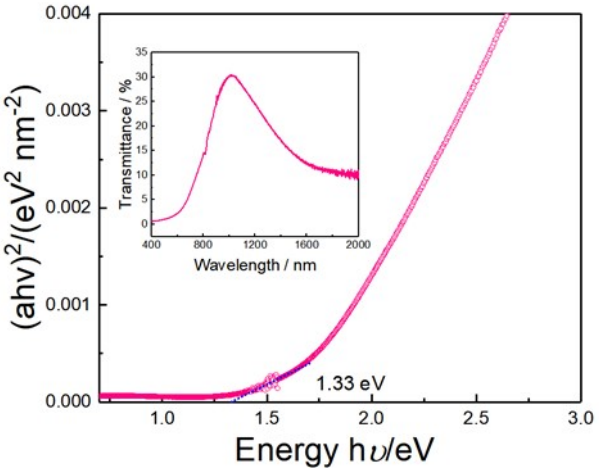

Fig. S6. Tauc plot of 250 °C annealed Sb_2Se_3. Inset corresponds to the transmittance spectrum.

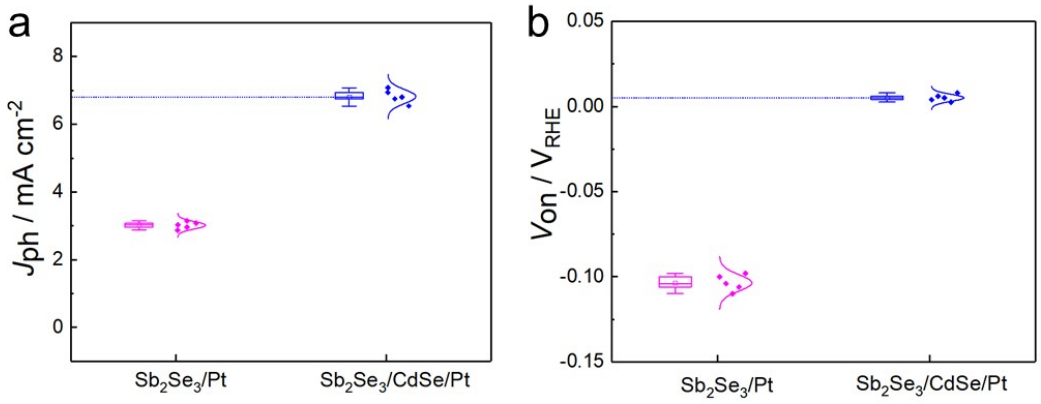

Fig. S7. The statistical distribution of (a) J_{ph} at −0.2 V_{RHE} and (b) V_{on} for Sb_2Se_3/Pt and Sb_2Se_3/CdSe/Pt devices.

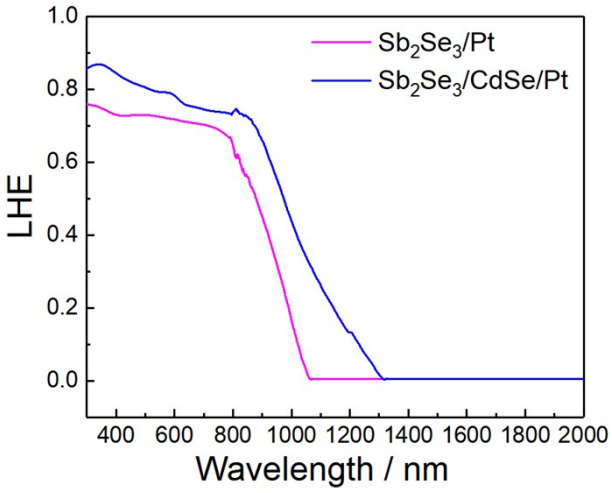

Fig. S8 Light-harvesting efficiency LHF curve of the devices.

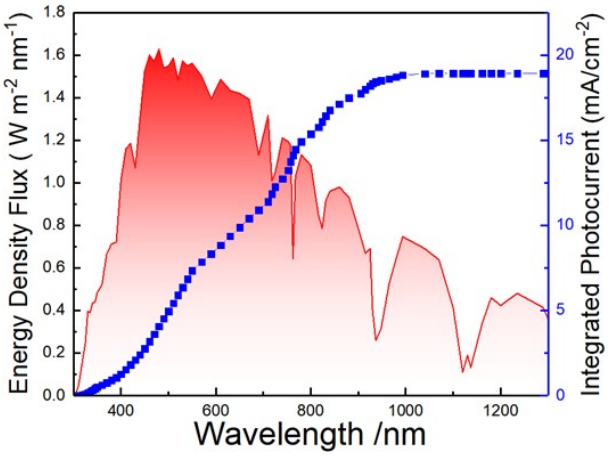

Fig. S9. The energy density flux for the standard AM 1.5G solar spectrum, along with the integrated photocurrent density of the photocathodes.

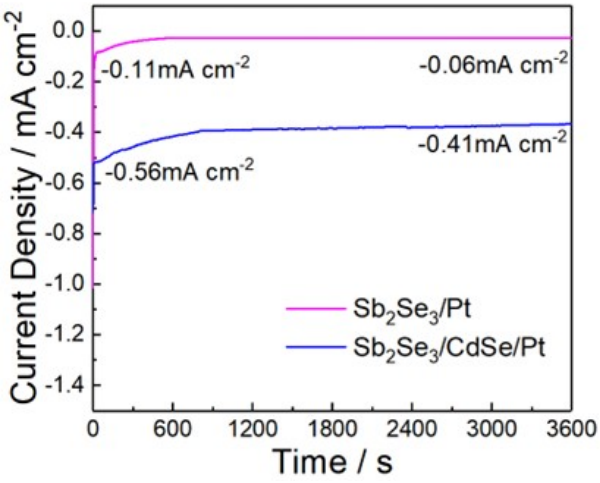

Fig. S10. The photostability measurements of Sb_2Se_3/Pt and Sb_2Se_3/CdSe/Pt photocathodes.

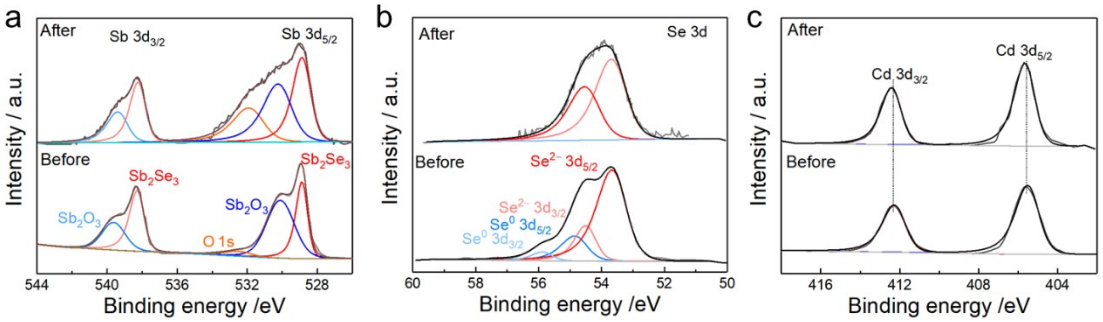

Fig. S11. High-resolution XPS spectra of (a) Sb 3d, (b) Se 3d and (c) Cd 3d of Sb_2Se_3/CdSe/Pt photoelectrode before and after stability test.

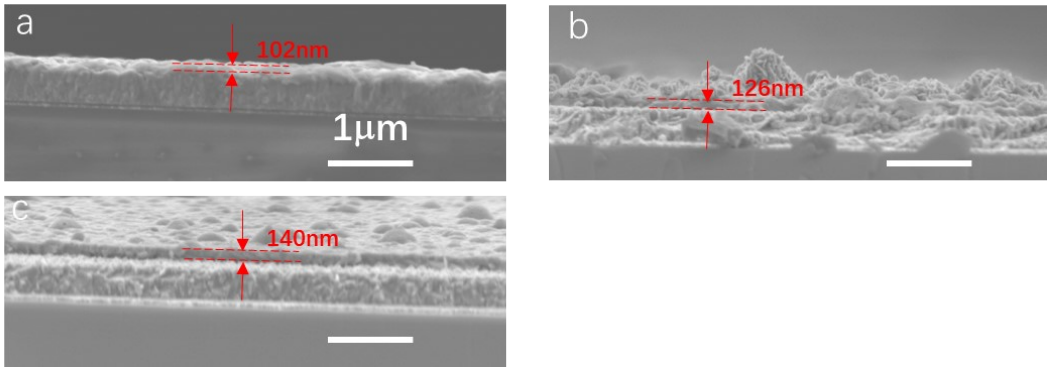

Fig. S12. The cross-sectional of the film obtained by passing (a) 0.125 (b) 0.25 (c) 0.5 C/cm^2 charge and annealed at 250 ℃ in Ar atmosphere.

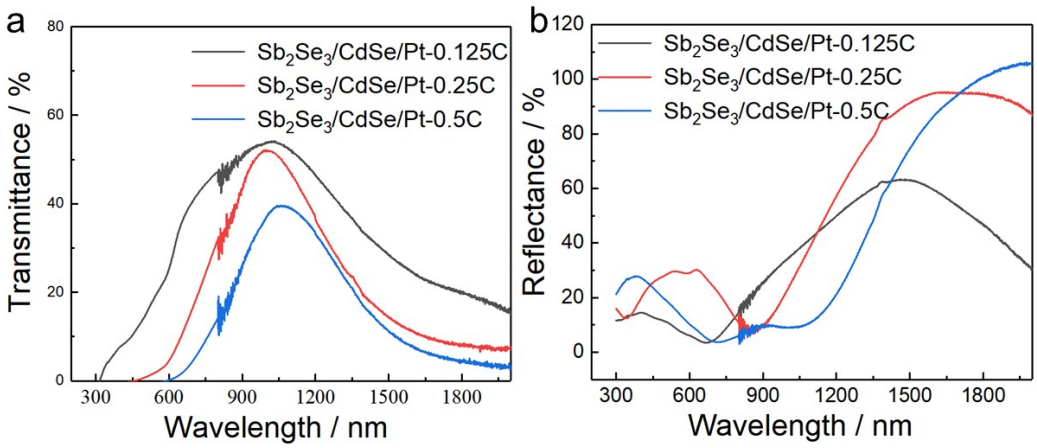

Fig. S13. (A) Transmittance spectra and (B) reflectance spectra of the film obtained by passing different charge densities.

Table S1. The corresponding parameters of M-S.

Sb_2Se_3 with different annealing temperature	Slope	N_d
200℃	30.68	0.032z
250℃	21.43	0.047z
300℃	24.16	0.041z

$z = 2/e_0\varepsilon_0\varepsilon$

Table S2. The corresponding parameters of M-S.

Sample	Slope	N_d
Sb_2Se_3/Pt	5.00	0.20z
Sb_2Se_3/CdSe/Pt	0.66	1.51z

$z = 2/e_0\varepsilon_0\varepsilon$

Table S3. Electrochemical parameters of photoelectrodes obtained from EIS study.

Samples/parameters	R_s/ Ω	R_{ct} / Ω	CPE_1/ μF cm^{-2}	R_1 / Ω	CPE_2/ μF cm^{-2}
Sb_2Se_3/CdSe/Pt-0.125C	46.84	6600	23.45	30455	85.56
Sb_2Se_3/CdSe/Pt-0.25C	59.26	224.0	20.61	10.84	11.83
Sb_2Se_3/CdSe/Pt-0.5C	60.01	701.2	14.57	832.9	58.64