Electronic Supplementary Material (ESI) for RSC Applied Interfaces.

Supplementary material

CdS-carbon black hybrid nanocomposite buffer layer for antimony sulfide solar cells

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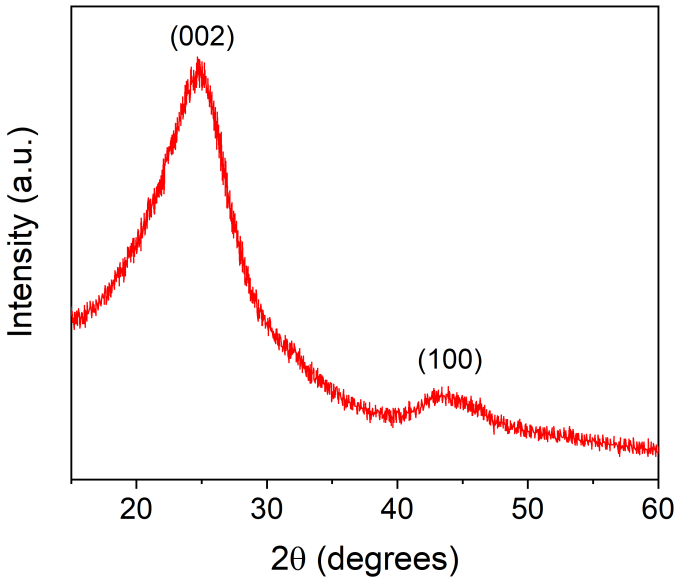

Figure S1. XRD pattern of the pristine CB powder.

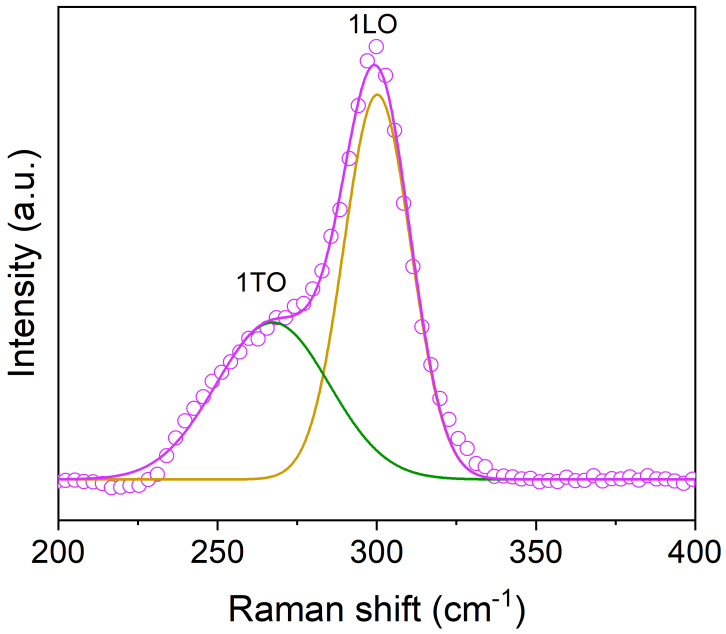

Figure S2. Fitting of the main Raman band, indicating the longitudinal optical (1LO) and transverse optical (1TO) mode.

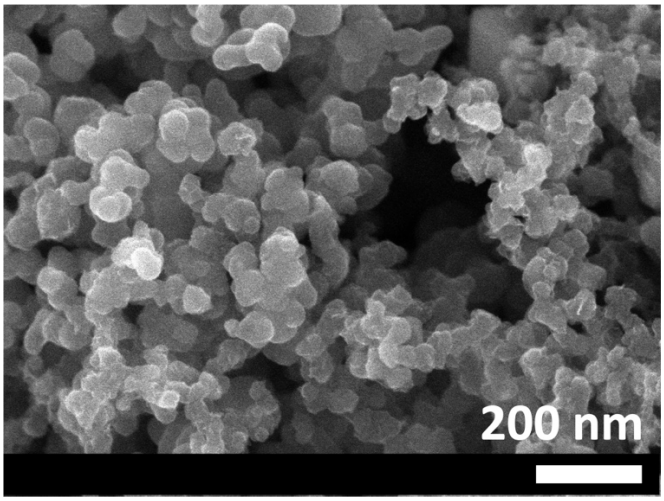

Figure S3. Representative SEM image of CB nanoparticles.

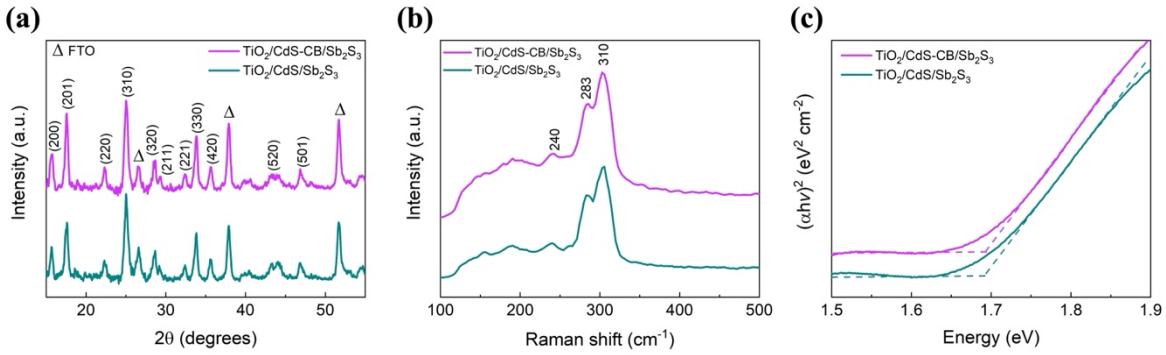

Figure S4. (a) XRD patterns, (b) Raman spectra and (c) Tauc plots of the Sb_2S_3 films deposited on CdS and CdS-CB films.

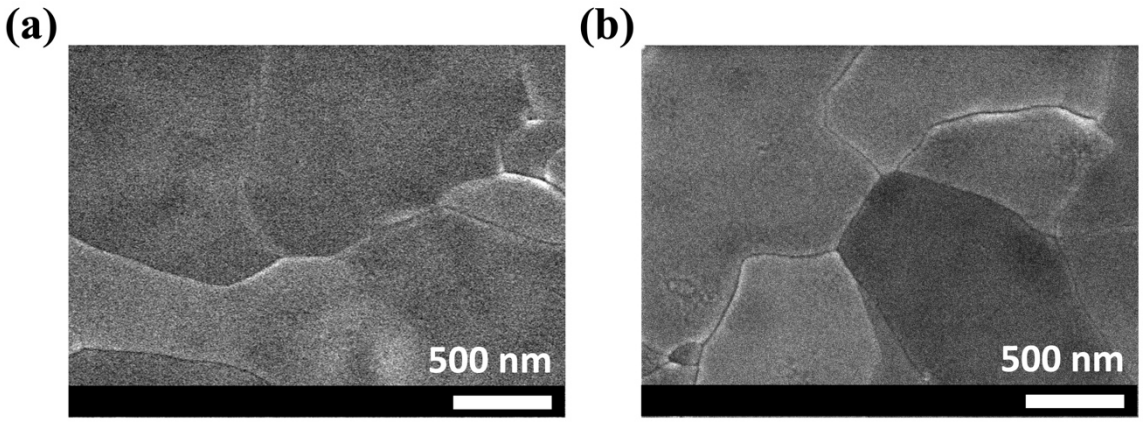

Figure S5. Top-view SEM images of the Sb_2S_3 film deposited on (a) TiO_2/CdS and (b) TiO_2/CdS-CB substrates.

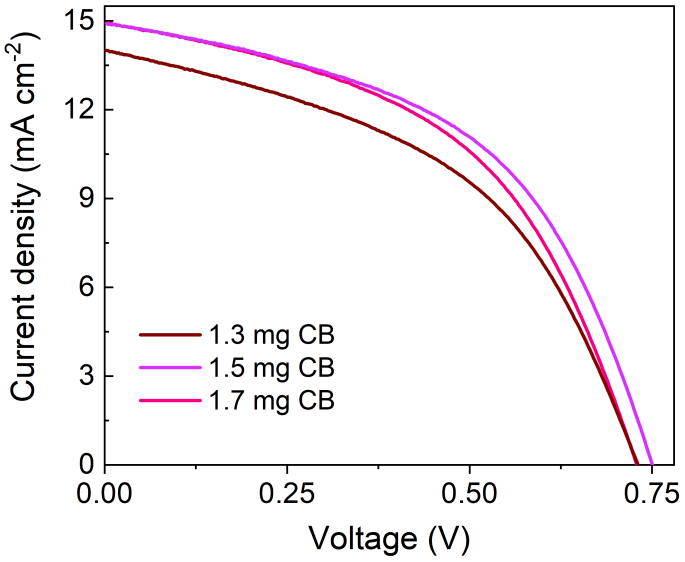

Figure S6. *J-V* curves of the CdSC-SC devices fabricated with different concentrations of CB.

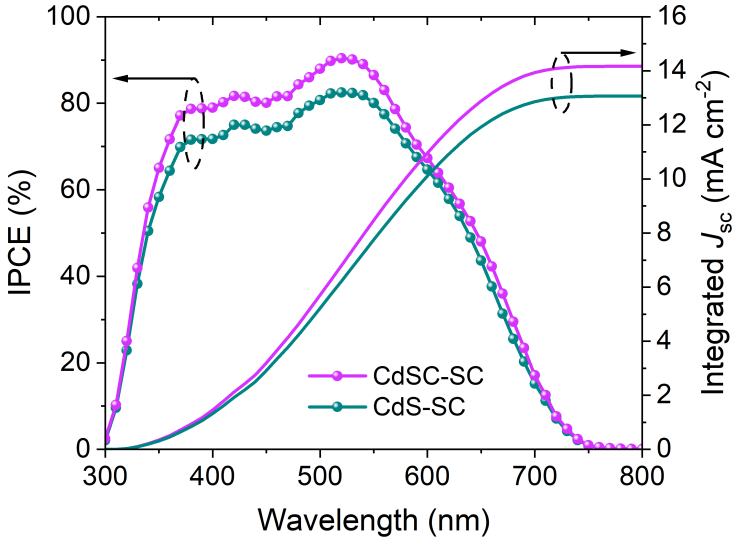

Figure S7. IPCE spectra and integrated J_{sc} of the champion CdS-SC and CdSC-SC devices.

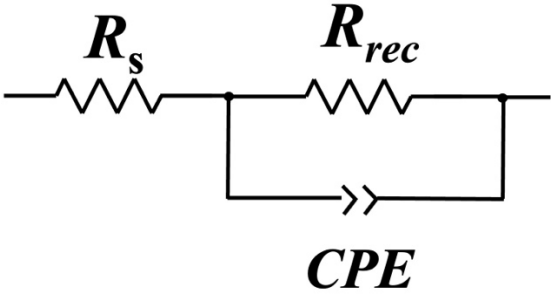

Figure S8. Equivalent circuit model for EIS analysis.

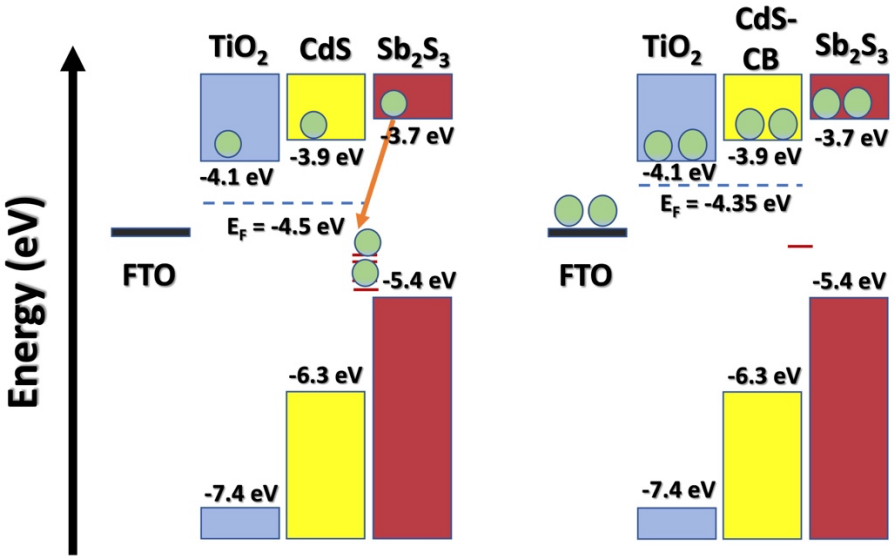

Figure S9. Energy level diagram of the CdS-SC and CdSC-SC devices. The green circles represent photogenerated electrons, whereas the red lines represent trap states.

Table S1. Photovoltaic parameters of the best-performing CdSC-SC devices with different concentrations of CB.

Device	J_{sc} (mA cm^{-2})	V_{oc} (V)	Fill factor (%)	PCE (%)
1.3 mg CB	14.05	0.73	50.72	5.18
1.5mg CB	14.92	0.75	53.81	6.03
1.7 mg CB	15.01	0.73	51.25	5.58

Table S2. Comparison of planar Sb_2S_3 solar cells based on different interfacial layers and this work.

Configuration	J_{sc} (mA cm^{-2})	V_{oc} (V)	FF (%)	PCE (%)	Ref
FTO/TiO_2/CdS/Sb_2S_3/spiro-OMeTAD/Au	15.1	0.76	56.0	6.40	[S1]
ITO/TiO_2/CdS/Sb_2S_3/C/Ag	17.12	0.72	58.8	7.23	[S2]
FTO/TiO_2/CdS/Sb_2S_3/Au	16.09	0.69	38.09	4.23	[S3]
FTO/TiO_2/CdS/Sb_2S_3/spiro-MeOTAD/Au	19.61	0.66	47.03	5.59	[S4]
FTO/TiO_2/CdS/Sb_2S_3/spiro-MeOTAD/Au	16.27	0.68	53.00	5.86	[S5]
FTO/TiO_2/CdS-C/Sb_2S_3/spiro-MeOTAD/Au	14.92	0.75	53.81	6.03	This work

References

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