Supporting Information

Rationally-Designed Hierarchical Hollow $CuS/CdIn_2S_4$ Heterostructure Nanoboxes for Boosted Photoreduction of CO_2

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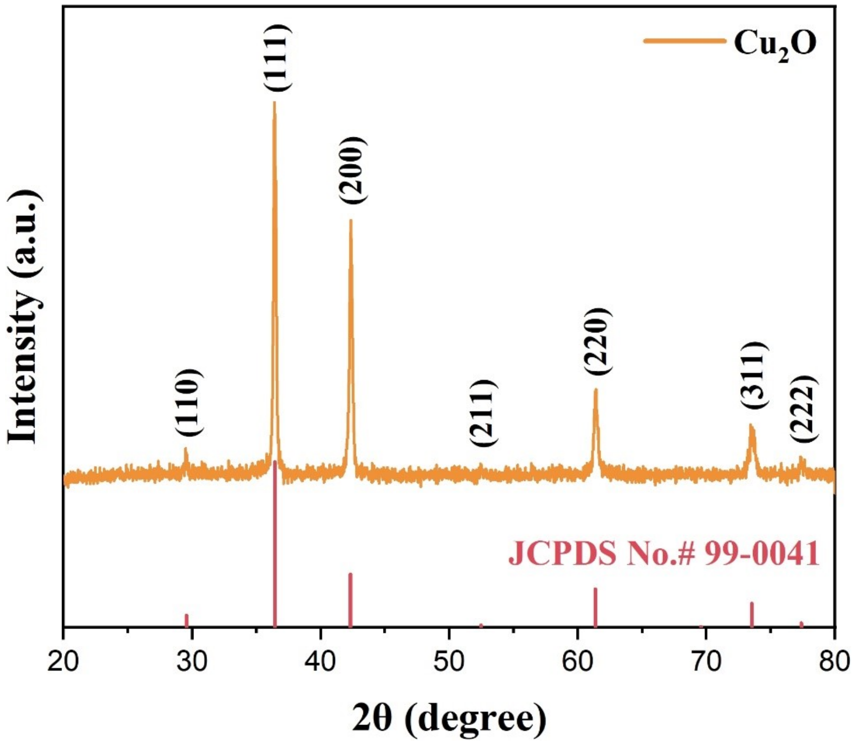

Fig. S1. XRD pattern of Cu_2O nanocubes.

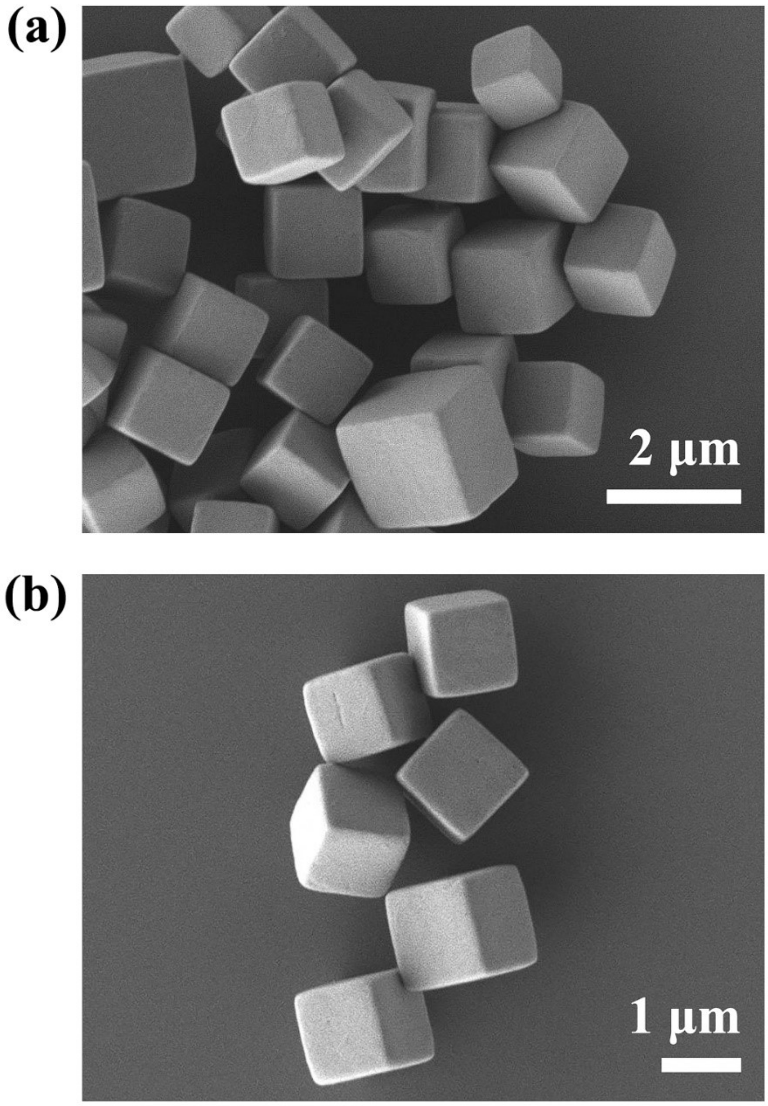

Fig. S2. (a-b) SEM images of Cu_2O nanocubes.

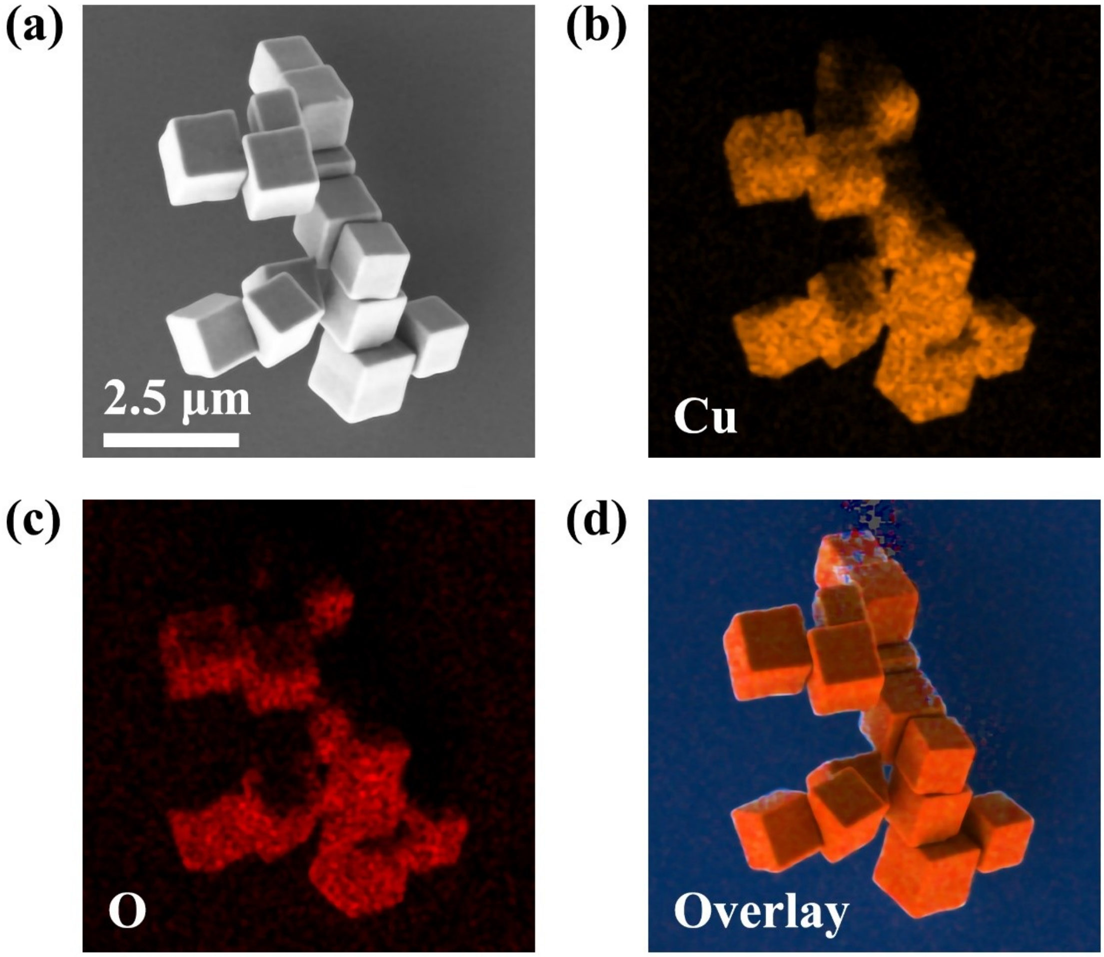

Fig. S3. EDX elemental mapping of Cu_2O nanocubes.

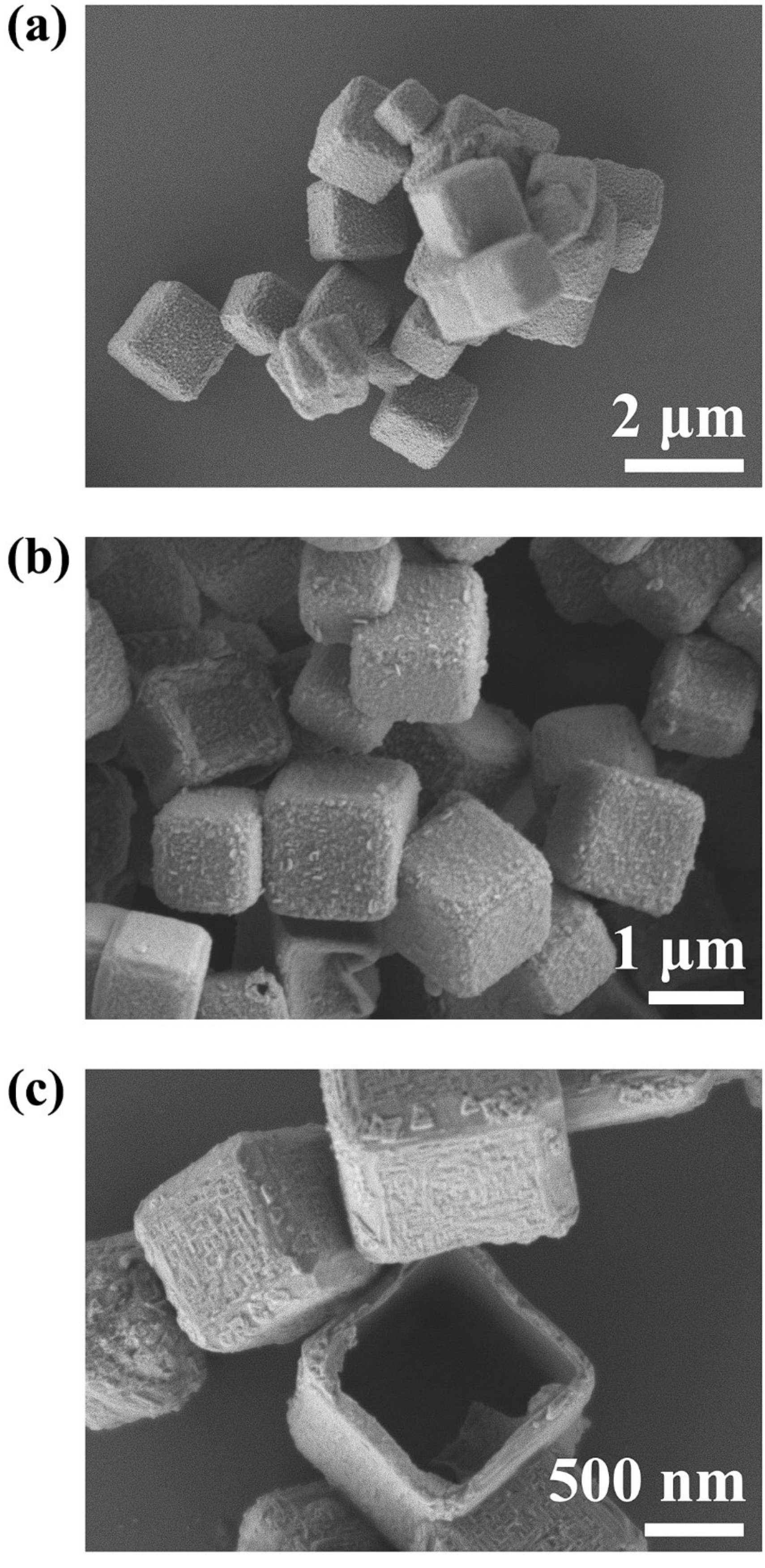

Fig. S4. (a-c) SEM images of CuS nanoboxes.

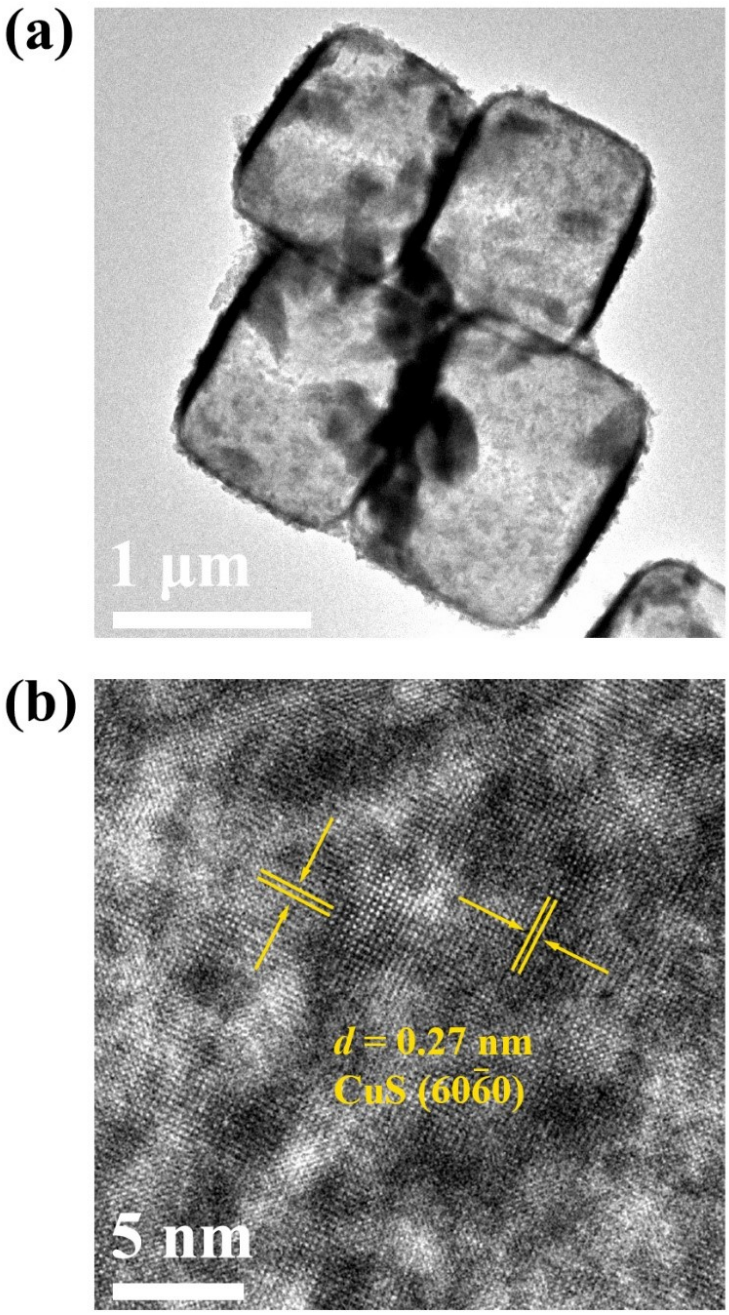

Fig. S5. (a) TEM and (b) HRTEM images of CuS nanoboxes.

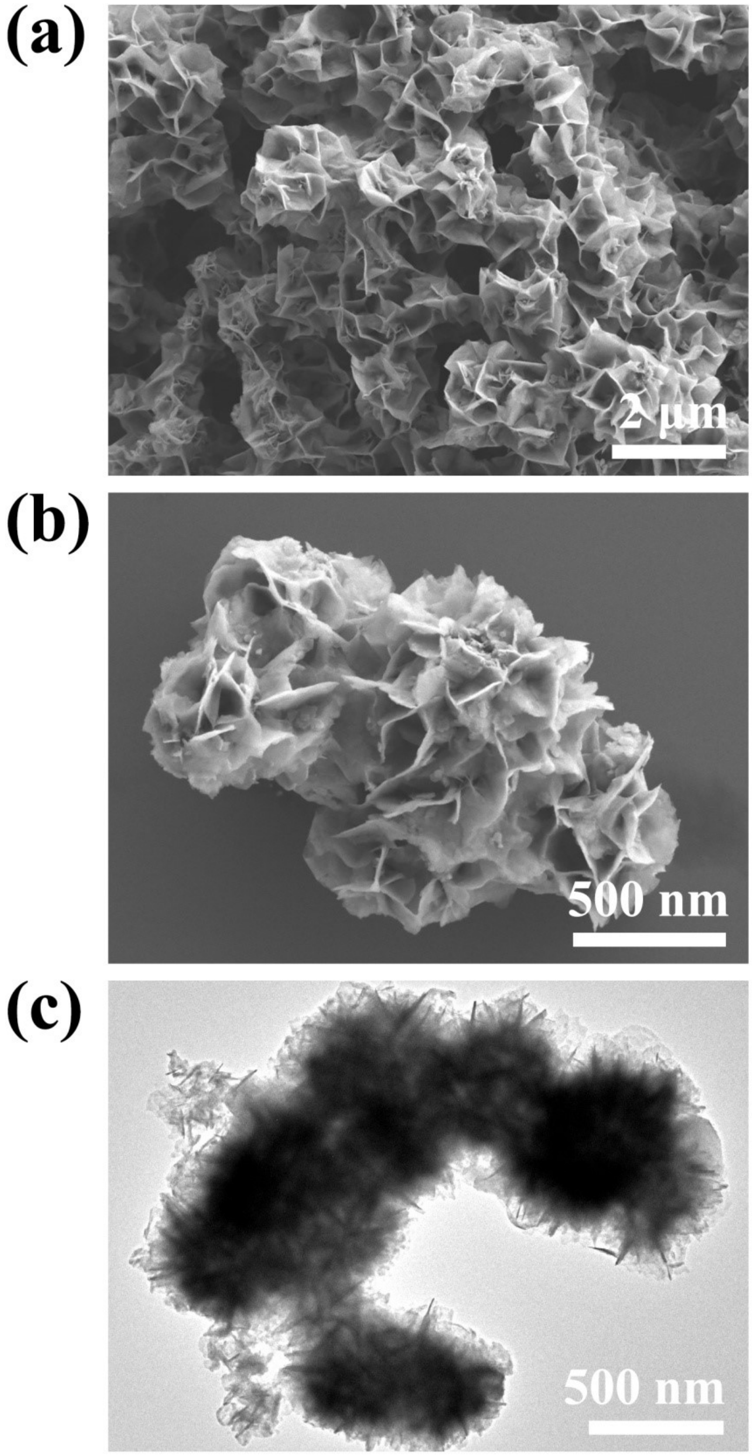

Fig. S6. (a-b) SEM and (c) HRTEM images of pristine $CdIn_2S_4$.

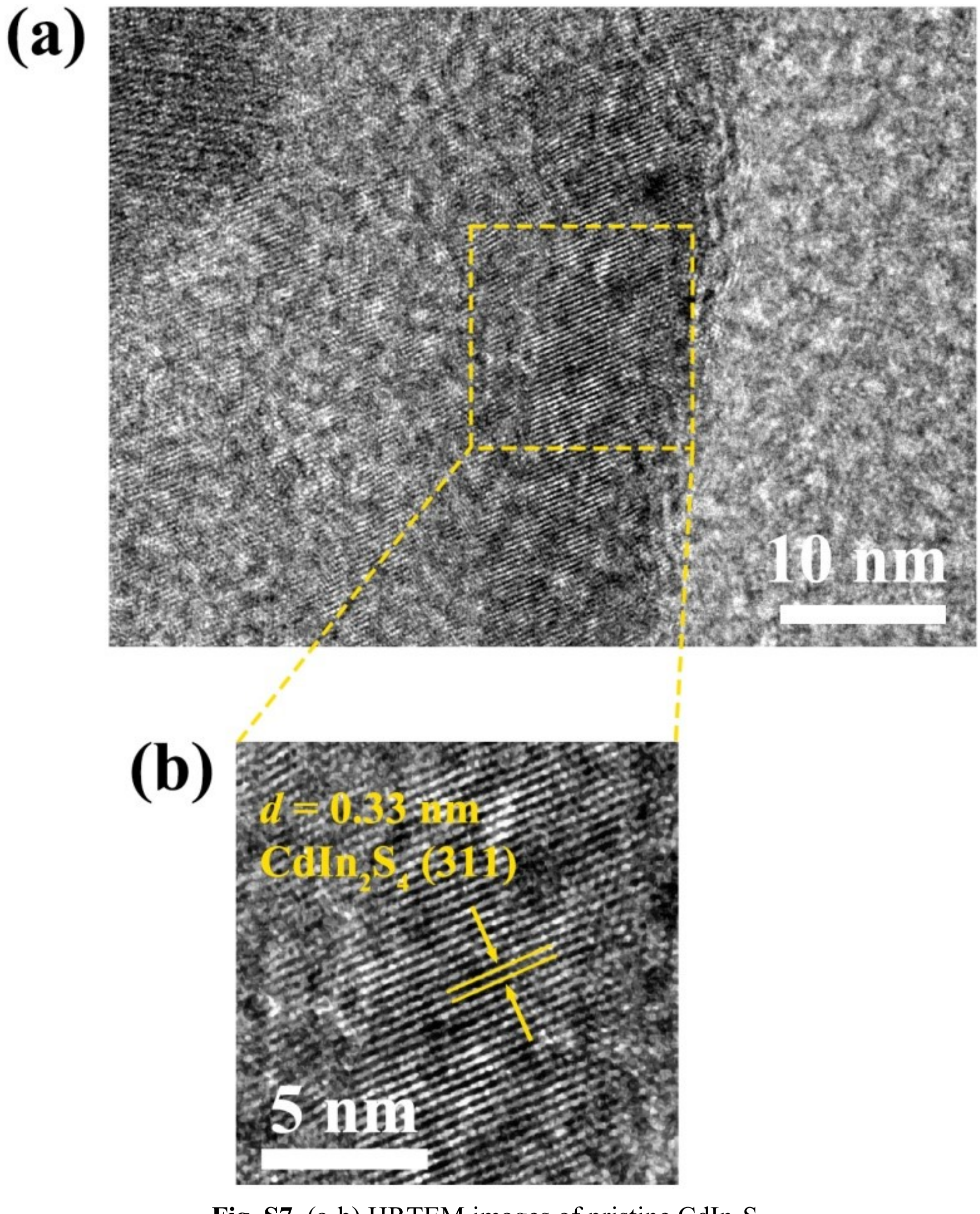

Fig. S7. (a-b) HRTEM images of pristine $CdIn_2S_4$.

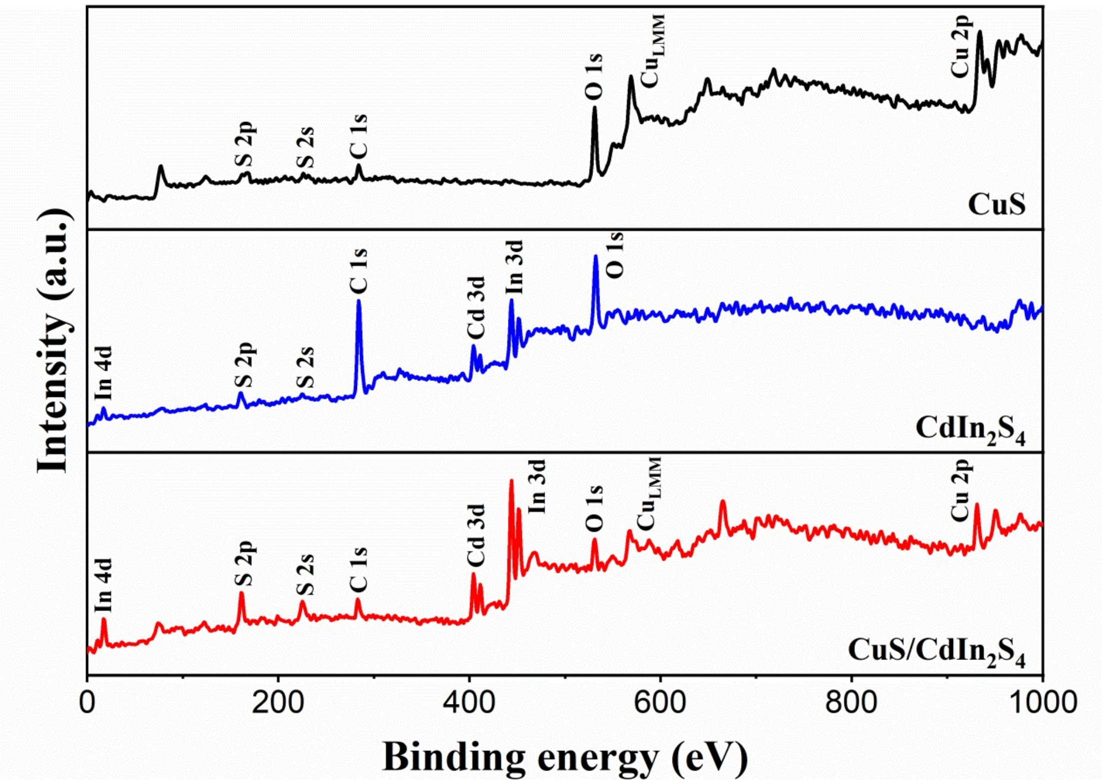

Fig. S8. XPS Surveys of CuS, $CdIn_2S_4$ and $CuS/CdIn_2S_4$.

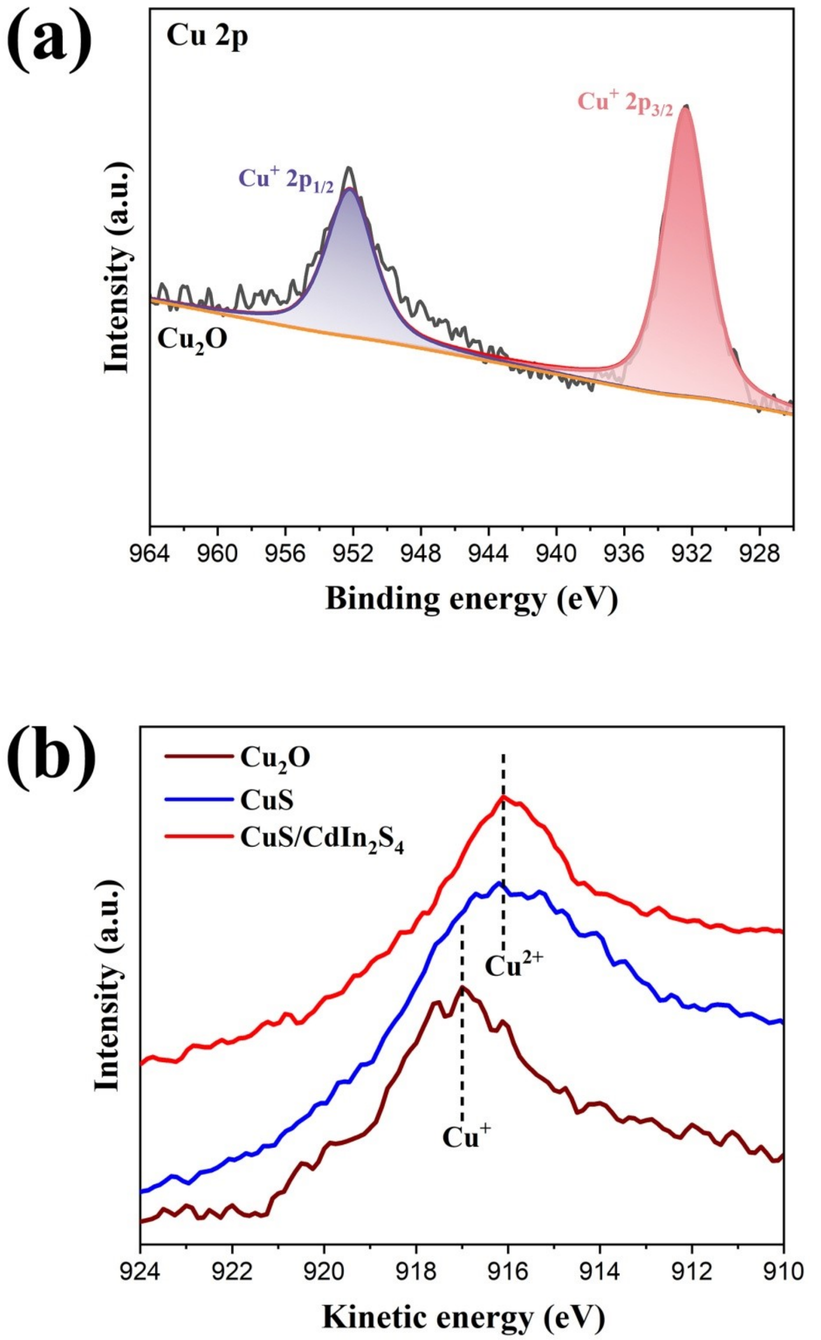

Fig. S9. (a) Cu 2p XPS spectrum of Cu_2O; (b) Cu-LMM Auger spectra of Cu_2O, CuS and $CuS/CdIn_2S_4$.

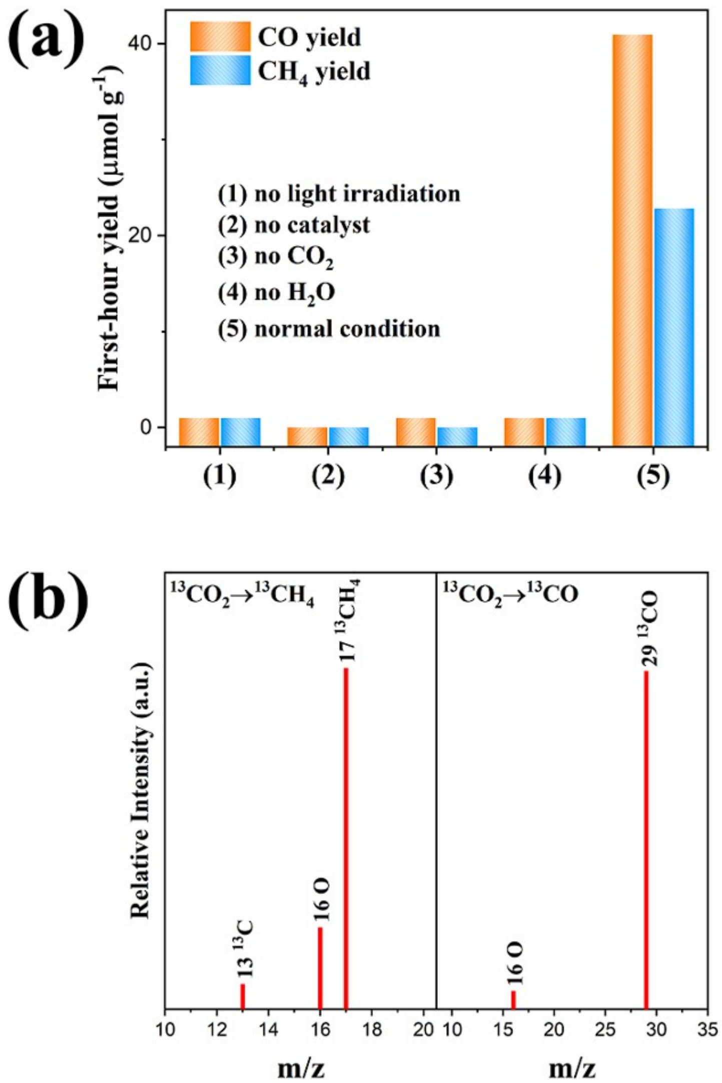

Fig. S10. (a) Blank experiments and (b) $^{13}CO_2$ isotopic mapping of $CuS/CdIn_2S_4$.

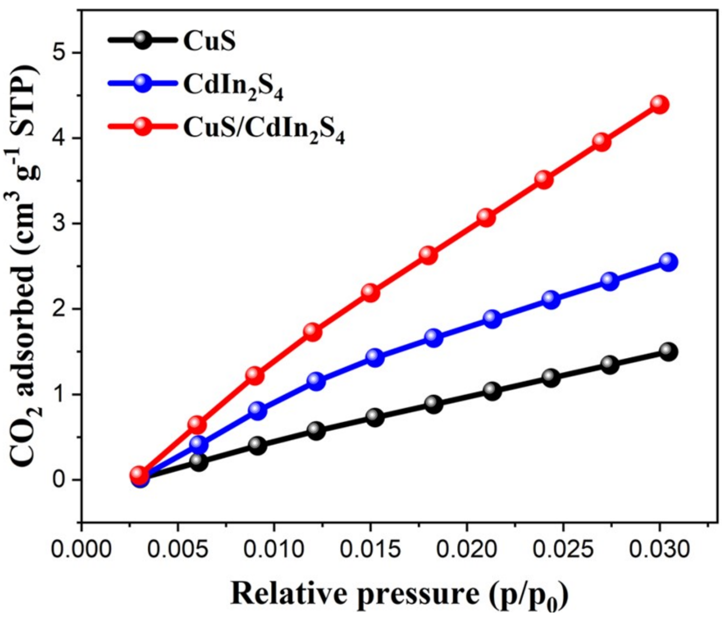

Fig. S11. CO_2 adsorption isotherms of CuS, $CdIn_2S_4$ and CuS/$CdIn_2S_4$ (at 0℃).

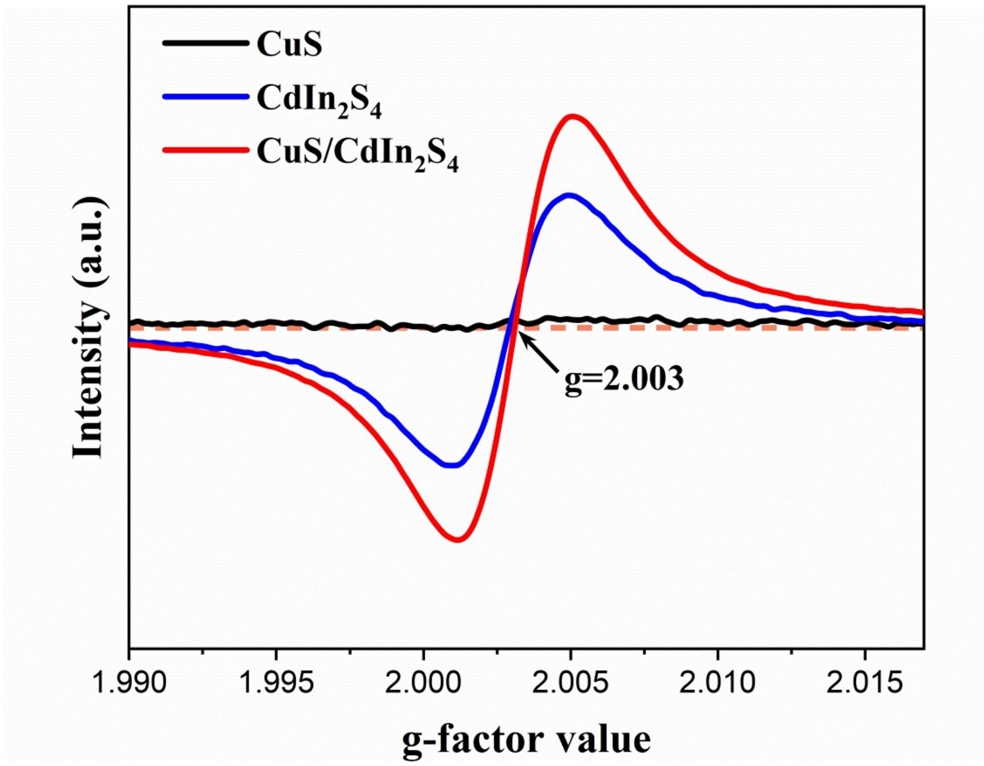

Fig. S12. Electron paramagnetic resonance spectra of CuS, $CdIn_2S_4$ and CuS/$CdIn_2S_4$.

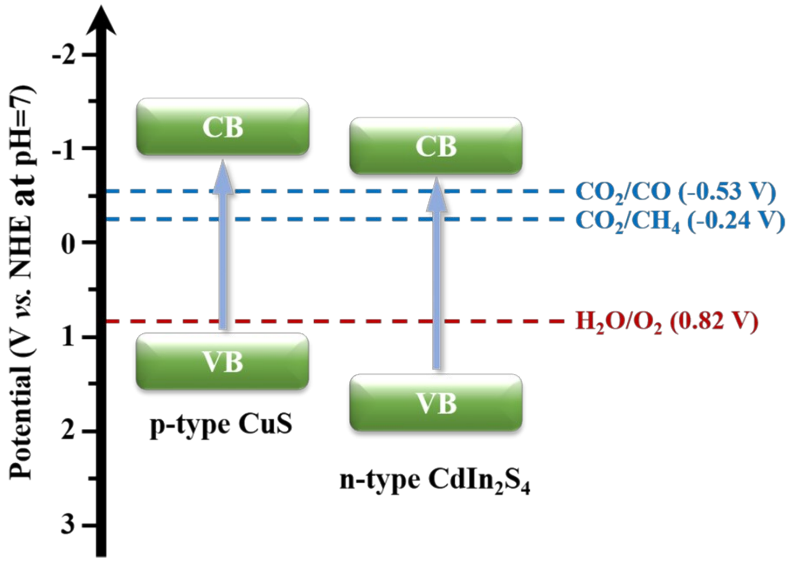

Fig. S13. Band alignment of CuS and $CdIn_2S_4$.

Table. S1. Element mass ratio of $CuS/CdIn_2S_4$ heterostructures measured by inductively coupled plasma mass spectrometry (ICP-MS)

Element	Cu	Cd	In	S
Weight ratio (wt%)	20.4	15.8	32.7	30.8

Table. S2. Photocatalysis performance comparison between $CuS/CdIn_2S_4$ heterostructures and recently reported CuS- or $CdIn_2S_4$- based materials.

Catalyst	Reaction condition	Average yield	Ref.
Cu_2S/CuS NRs	CO_2+H_2O Newport solar simulator AM 1.5 sunlight	CH_4 (38 μmol m^{-2} h^{-1})	**[1]**
CuS_x-TiO_2	CO_2+H_2O 6.0 W cm^{-2} mercury lamp λ = 365 nm	CH_4 (6.65 μmol g^{-1} h^{-1})	**[2]**
$Cu_{1.95}S@CuS$	CO_2+H_2O 300 W Xe lamp AM 1.5G filter	CO (28.65 μmol g^{-1} h^{-1})	**[3]**
$Cu-Cu_2O-CuS$	CO_2+H_2O 300 W Xe lamp (400 nm ≤ λ ≤ 1100 nm)	CO (22.6 μmol g^{-1} h^{-1}) CH_4 (3.06 μmol g^{-1} h^{-1})	**[4]**
$CdIn_2S_4/TiO_2$	CO_2+H_2O 300 W Xe lamp	CO (18.32 μmol g^{-1} h^{-1}) CH_4 (1.03 μmol g^{-1} h^{-1})	**[5]**
WO_3 QDs/$CdIn_2S_4$	CO_2+H_2O 300 W Xe lamp 420 nm cut-off filter	CO (8.2 μmol g^{-1} h^{-1}) CH_4 (1.6 μmol g^{-1} h^{-1})	**[6]**
$CdIn_2S_4$/Au/rGO	CO_2+H_2O+TEOA 300 W Xe lamp	CO (19.3 μmol g^{-1} h^{-1}) CH_4 (5.4 μmol g^{-1} h^{-1})	**[7]**
$CuS/CdIn_2S_4$	CO_2+H_2O 300 W Xe lamp	CO (33.28 μmol g^{-1} h^{-1}) CH_4 (14.61 μmol g^{-1} h^{-1})	This work

References

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