Electronic Supplementary Information

p-Cu_2S/n-$Zn_xCd_{1-x}S$ nanocrystals dispersed in 3D porous graphene nanostructure: an excellent photocatalyst for hydrogen generation through sun light driven water splitting

Chun-Chieh Wang[a], Je-Wei Chang[a] and Shih-Yuan Lu[a*]

Department of Chemical Engineering, National Tsing-Hua University
Hsin-Chu 30013, Taiwan
E-mail: SYLU@mx.nthu.edu.tw

Table S1. Comparison of specific hydrogen evolution rate of metal sulfide based sun light driven water splitting

Ref.	Photocatalyst	Specific H_2 evolution rate (μmole $hr^{-1}g^{-1}$)
26	$Cu_{0.8}Ag_{0.2}GaS_2$/Ru	890
26	$AgGaS_2$/Ru	2635
27	ZnS-CuS-CdS	838
28	$((Cu_{0.75}Ag_{0.25})_2ZnSnS_4)_{0.9}(ZnS)_{0.4}$/Ru	750
This work	$Zn_{0.71}Cd_{0.29}S$/StG/Cu_2S	1202

Table S2. Band gap energies of $Zn_xCd_{1-x}S$ as function of x.

Material	Energy band gap (eV)
ZnS	3.6
$Zn_{0.8}Cd_{0.2}S$	2.77
$Zn_{0.71}Cd_{0.29}S$	2.68
$Zn_{0.45}Cd_{0.55}S$	2.56
$Zn_{0.18}Cd_{0.82}S$	2.46
$Zn_{0.12}Cd_{0.88}S$	2.44
CdS	2.35

Table S3. Specific surface areas of $Zn_xCd_{1-x}S$ nanocrystals.

Photocatalyst	Specific surface area (m^2g^{-1})
ZnS	77
$Zn_{0.8}Cd_{0.2}S$	86
$Zn_{0.71}Cd_{0.29}S$	92
$Zn_{0.45}Cd_{0.55}S$	93
$Zn_{0.18}Cd_{0.82}S$	86
$Zn_{0.12}Cd_{0.88}S$	86
CdS	74

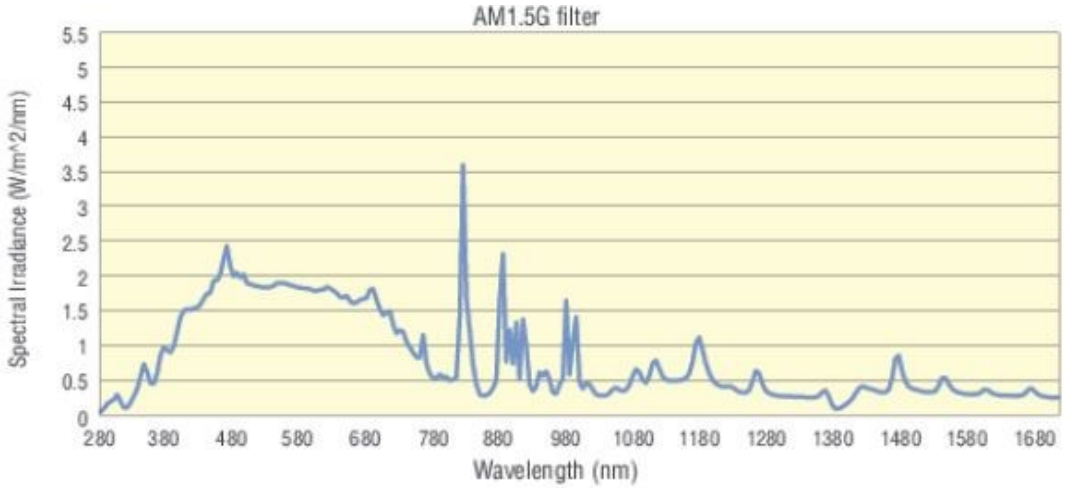

Figure S1. Spectrum of light source from https://www.newport.com/f/small-area-solar-simulators.

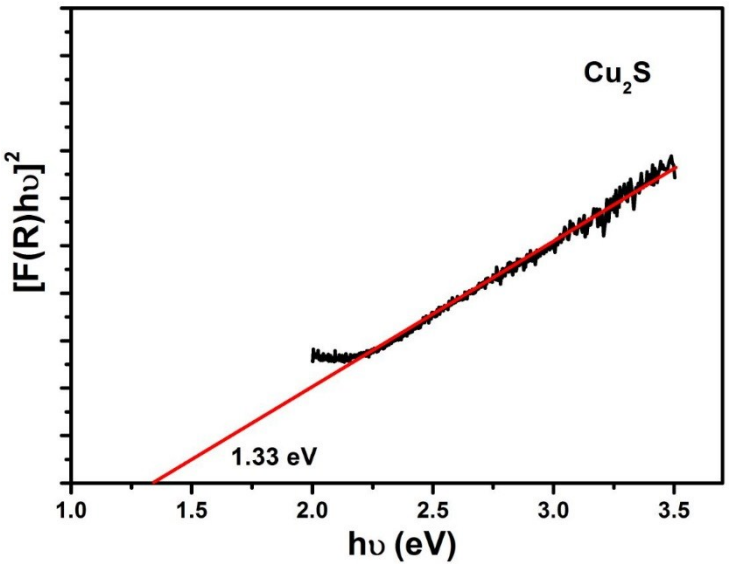

Figure S2. Plot of $(F(R)h\upsilon)^2$ vs. photo energy ($h\upsilon$) for Cu_2S.

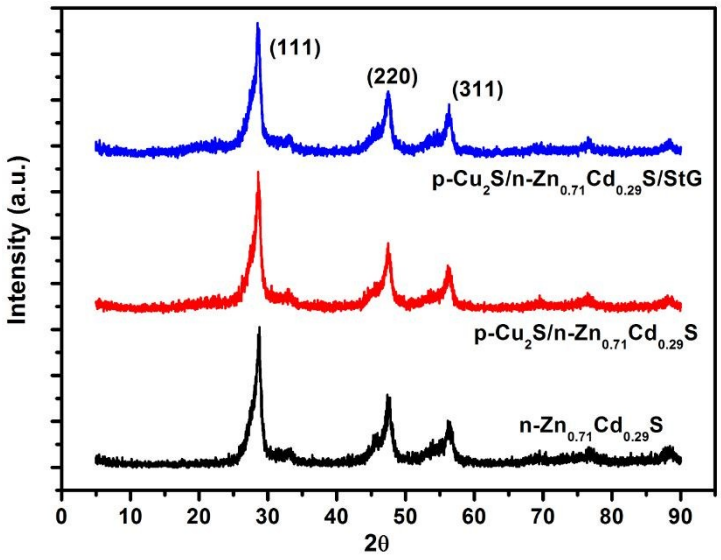

Figure S3. XRD patterns of n-$Zn_{0.71}Cd_{0.29}S$, p-Cu_2S/n-$Zn_{0.71}Cd_{0.29}S$, and p-Cu_2S/n-$Zn_{0.71}Cd_{0.29}S$/StG. Loadings of Cu_2S and StG were 1 and 0.06 wt.%, respectively.