Supporting information for

Hierarchical SnS@$ZnIn_2S_4$ marigold flower 2 D nano heterostructure as an efficient photocatalyst for sunlight-driven hydrogen generation

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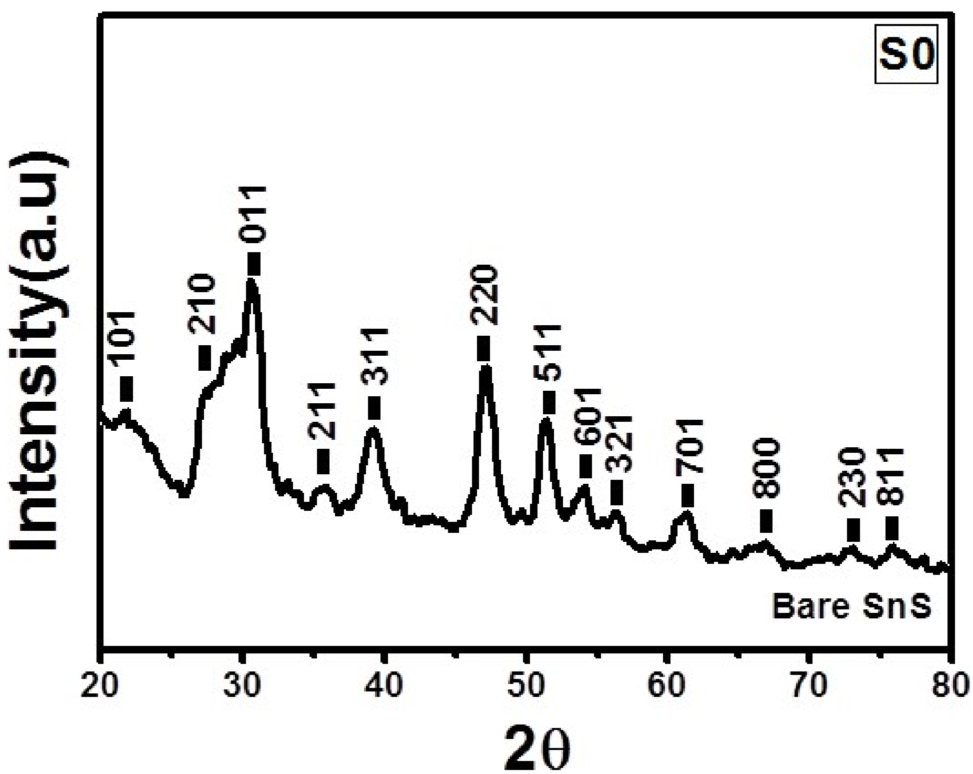
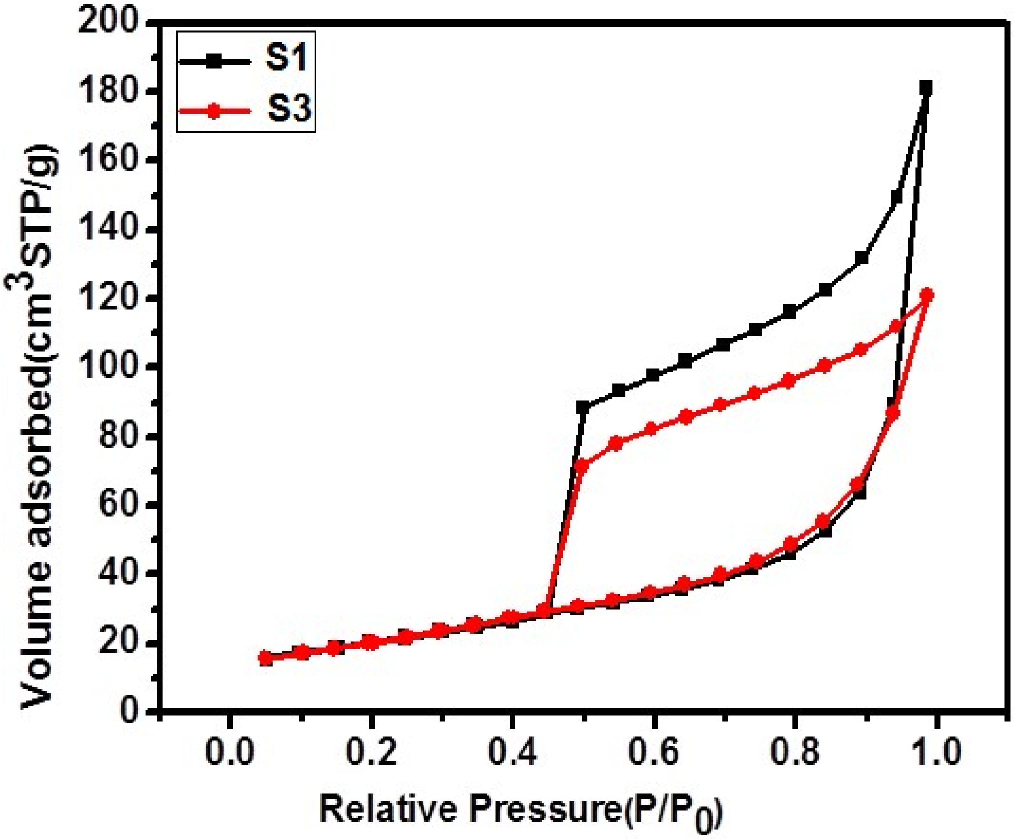
ESI Fig. I



ESI Fig. I X-ray diffraction patterns of pure SnS

ESI Fig. II

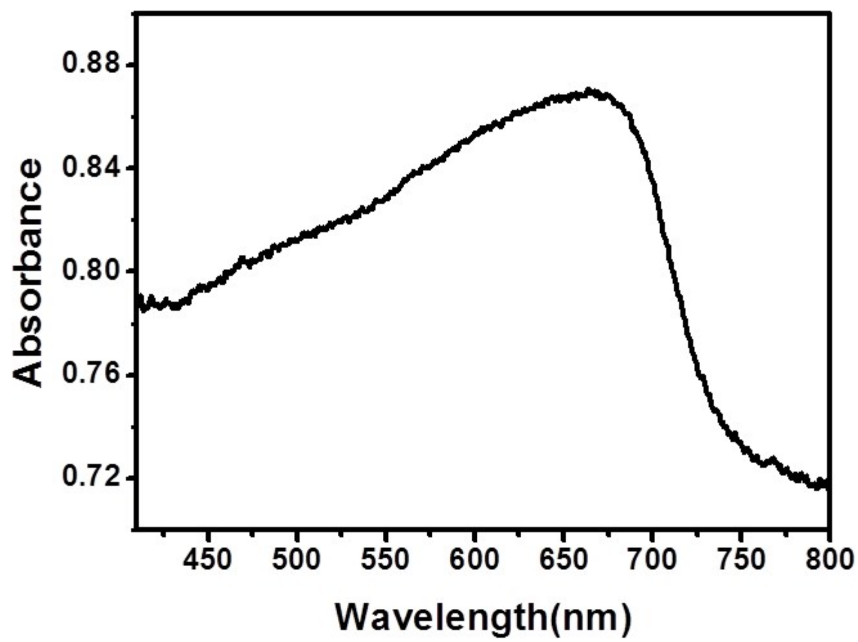


ESI Fig. II. Nitrogen adsorption-desorption isotherms obtained from the samples: (S1) $ZnIn_2S_4$ and (S3) $SnS@ZnIn_2S_4$.

ESI Table 1Textual property values BET Study

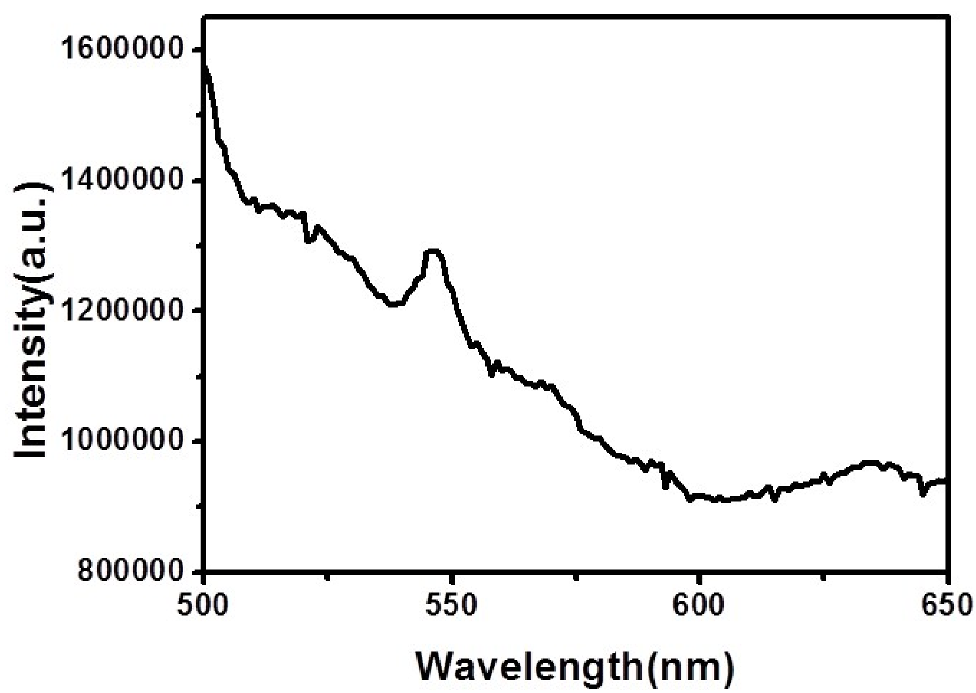
Code	Average Pore Size	Pore Volume	Surface Area
S1(Pure$ZnIn_2S_4$)	**7.5171e+000nm**	**2.8089e-001cc/g**	**74.7352m^2/g**
S3 (2%)	**5.1514e+000nm**	**1.8722e-oo1cc/g**	**78.3929m^2/g**

ESI Fig. III



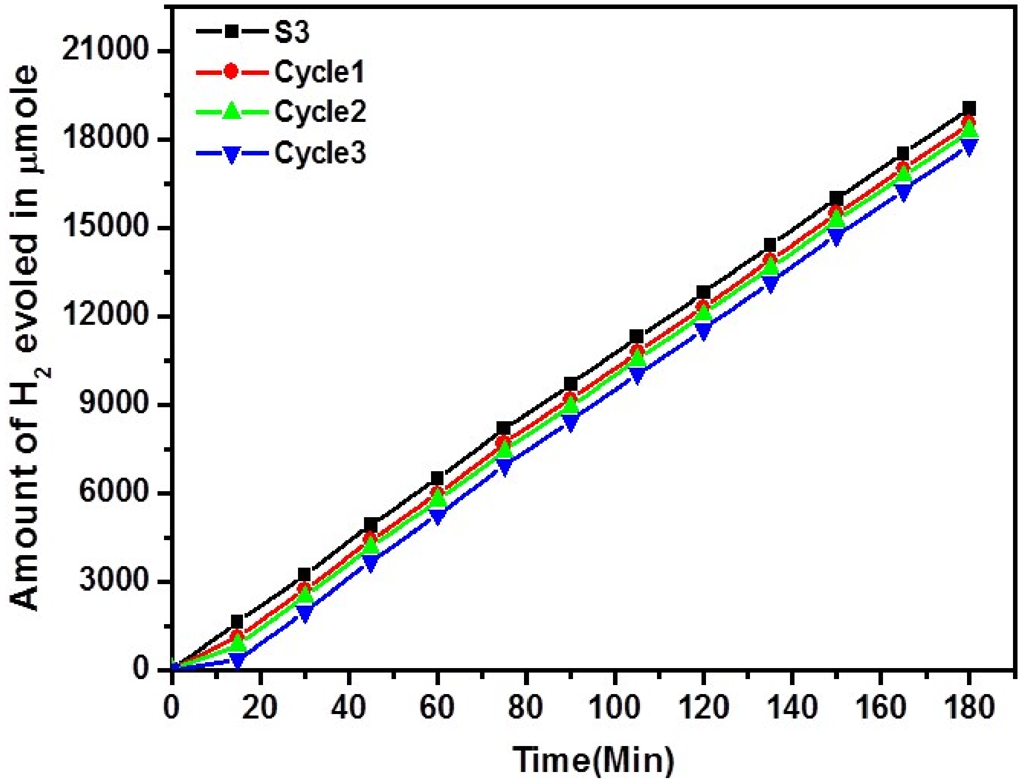
ESI Fig. III. UV-DRS spectra of pure Sn

ESI Fig. IV



ESI Fig. IV. Photoluminescence spectra of pure SnS

ESI-V Reusability study of H_2 (µmole) evolution from H_2S



Time versus volume of H_2 (µmole) evolution from H_2S of the S3 prepared with a different percent of SnS loading (S3) 2%.

Table 2: The H_2 generation rates for as-synthesized Sample S3 and Repeatability

Sr. No.	Sample code	H_2 evolution rate from H_2S (μmolh^{-1}g^{-1})
1	S3	6429
2	Cycle 1	6222
3	Cycle 2	5900
4	Cycle 3	5500

ESI-VI Reusability study of H_2 (μmole) evolution from H_2O

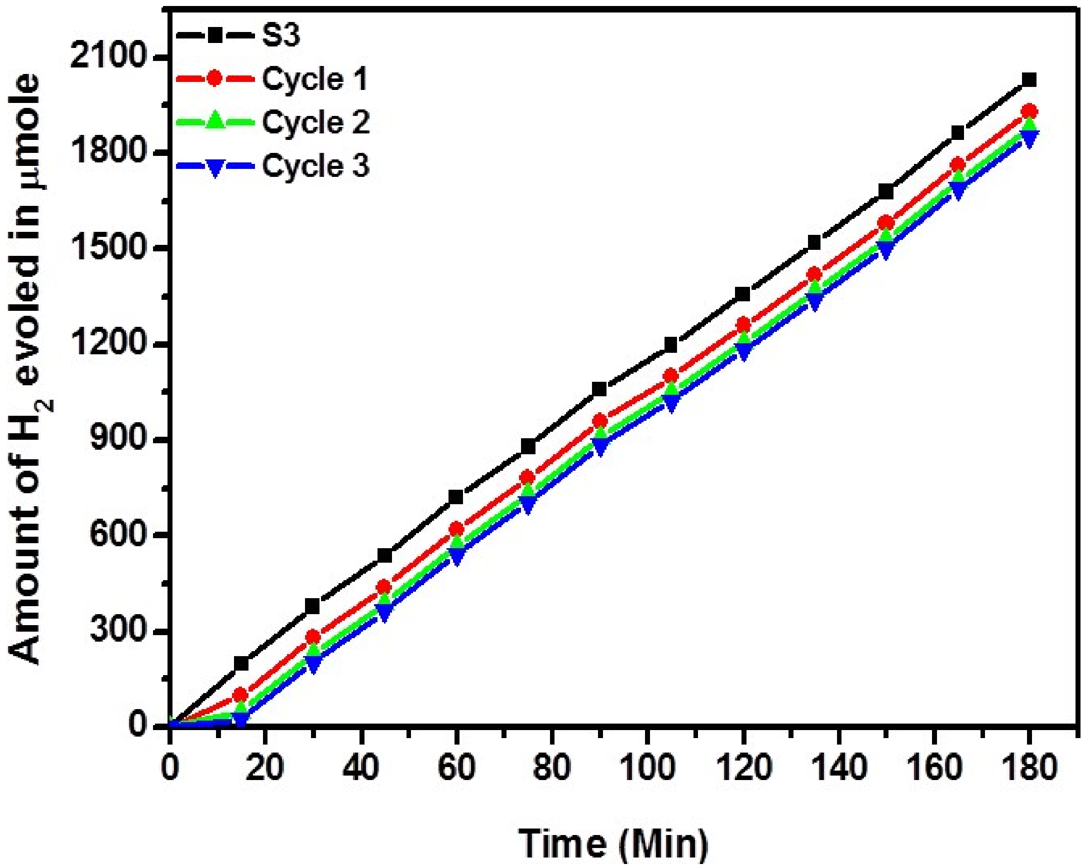


Table 3: The H_2 generation rates for as-synthesized Sample S3 and Repeatability Study

Sr. No.	Sample code	H_2 evolution rate from H_2O (μmolh^{-1}g^{-1})
1	S3	650
2	Cycle 1	610
3	Cycle 2	575
4	Cycle 3	531

Table 4: Comparison of rate of Photocatalytic H_2 Production of similar heterostructure system reported previously

Photocatalyst	Sacrificial reagent system	Source	H_2 Production rate From H_2O	H_2 Production rate From H_2S	**References**
$ZnFe_2O_4/ZnIn_2S_4$	0.35 M Na_2S + 0.25 M Na_2SO_3	300 W Xe-lamp	79.0 µmol h^{-1}	-	**1**
CdS QDs/graphene/$ZnIn_2S_4$	Na_2S (5 mL, 0.1 mol L^{-1}) + Na_2SO_3 (5 mL, 0.04 mol L^{-1})	300 W Xe-lamp	2.7 mmol h^{-1}	-	**2**
Cu-Doped $ZnIn_2S_4$	0.25 M Na_2S + 0.35 M Na_2SO_3	300 W Xe-lamp	151.5 μmol/h	-	**3**
$AgIn_5S_8$ nanoparticles anchored on 2D layered $ZnIn_2S_4$	0.25 M Na_2S + 0.25 M Na_2SO_3	300 W Xe-lamp	265.9 µmol g^{-1} h^{-1}	-	**4**
$NiS/ZnIn_2S_4$	0.5 M Na_2SO_3 + 0.43 M Na_2S	300 W Xe-lamp	104.7 µmol/h	-	**5**
$SnS@ZnIn_2S_4$	$Na_2S/Na_2S_2O_3$	Sunlight	650 µmol $h^{-1}g^{-1}$	6429 µmol $h^{-1}g^{-1}$	Present Work

References

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