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Supporting Information

Efficient photocatalytic hydrogen evolution under visible light by ternary composite CdS@NU-1000/RGO

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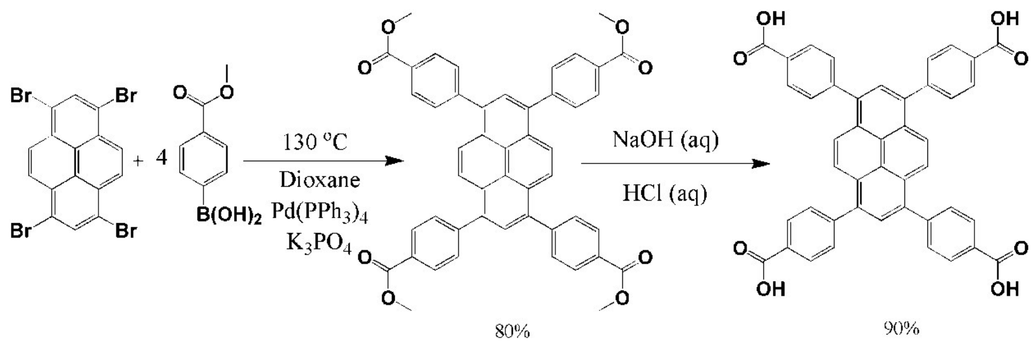
Synthesis of 1,3,6,8-tetrakis(p-benzoic acid)pyrene 1,3,6,8-tetrakis(pbenzoic acid) pyrene (TBAPy).



Scheme S1. Synthetic procedure of TBAPy.

The synthesis was performed according to the previous literature.[15] (The ref. belongs to main draft)

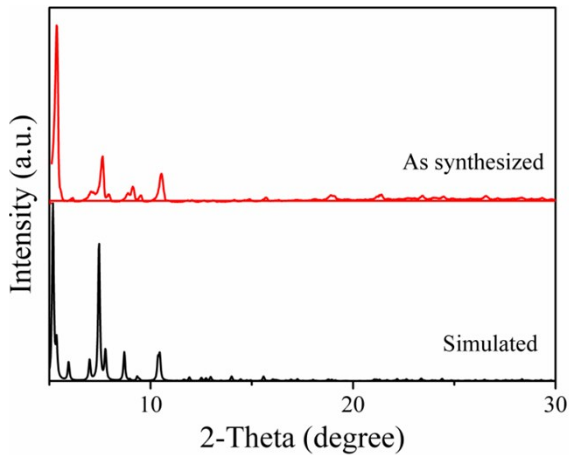


Figure S1. The XRD pattern of NU-1000.

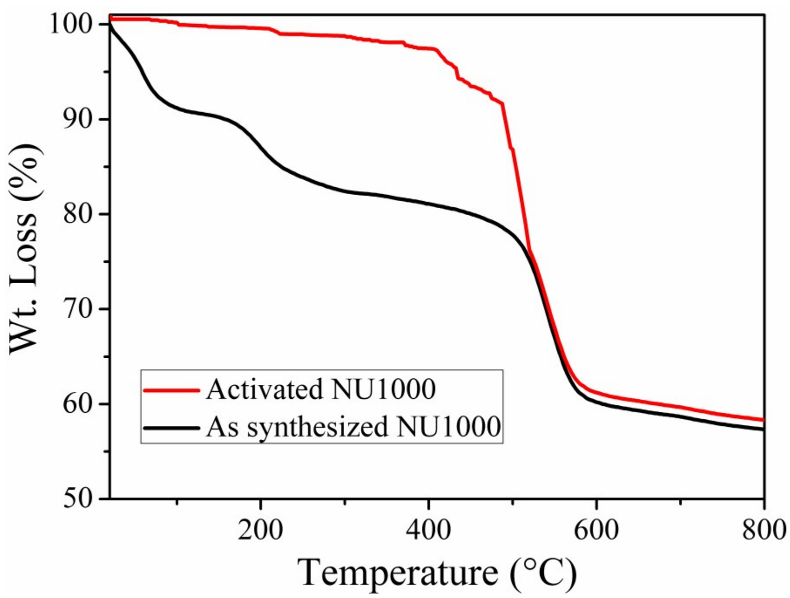


Figure S2. The thermogravimetric graph of NU-1000 under nitrogen atmosphere.

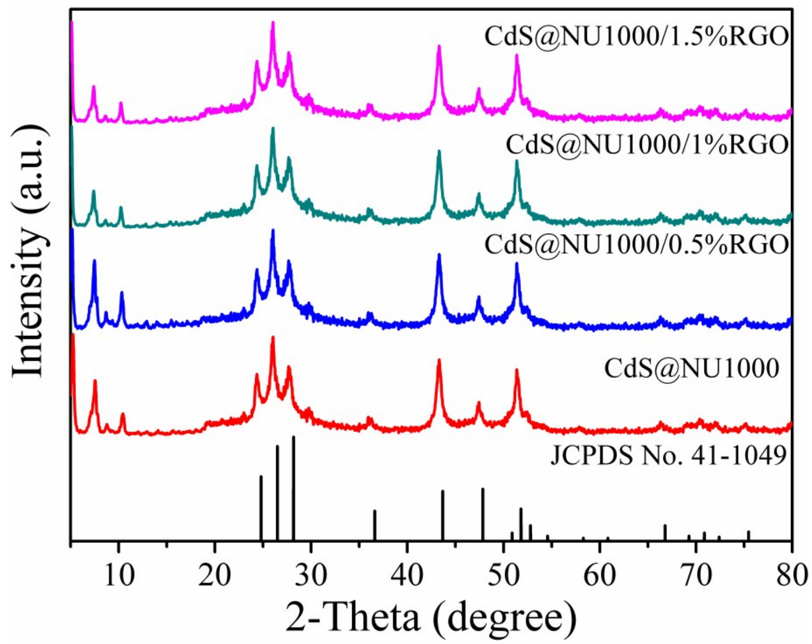


Figure S3. The PXRD of CdS contained composites.

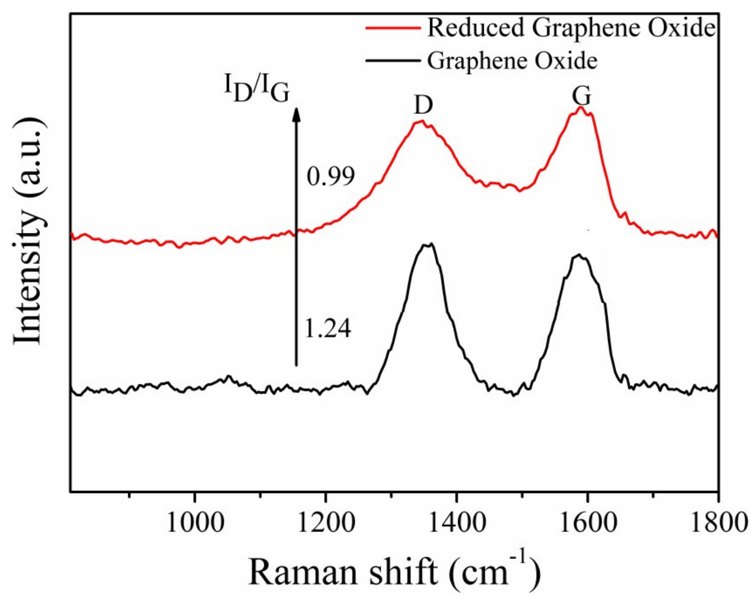


Figure S4. The Raman spectra of GO and RGO.

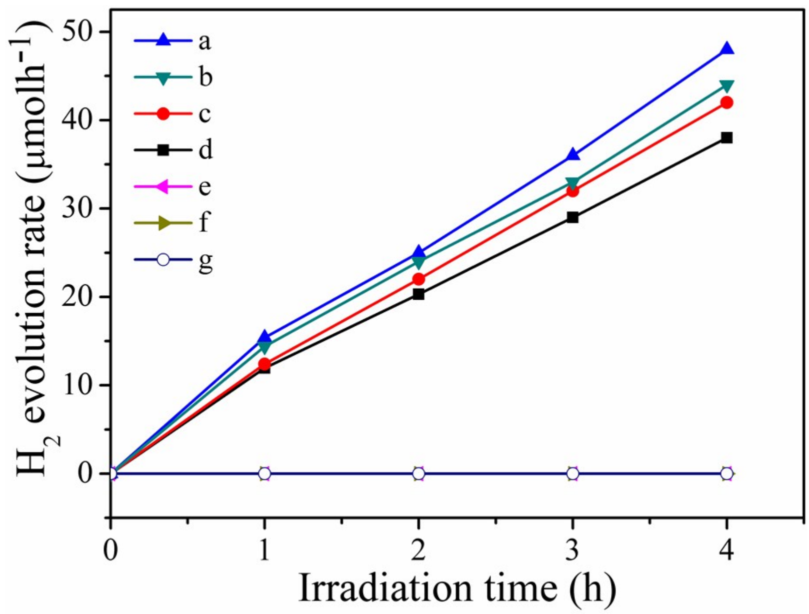


Figure S5. The hydrogen production activity of (a) CdS@NU-1000/1%RGO; (b) CdS@NU100/1.5%RGO; (c) CdS@NU-1000/0.5%RGO; (d) CdS@NU-1000; (e) NU-1000; (f) RGO; (g) CdS@NU-1000/1%RGO in the dark.

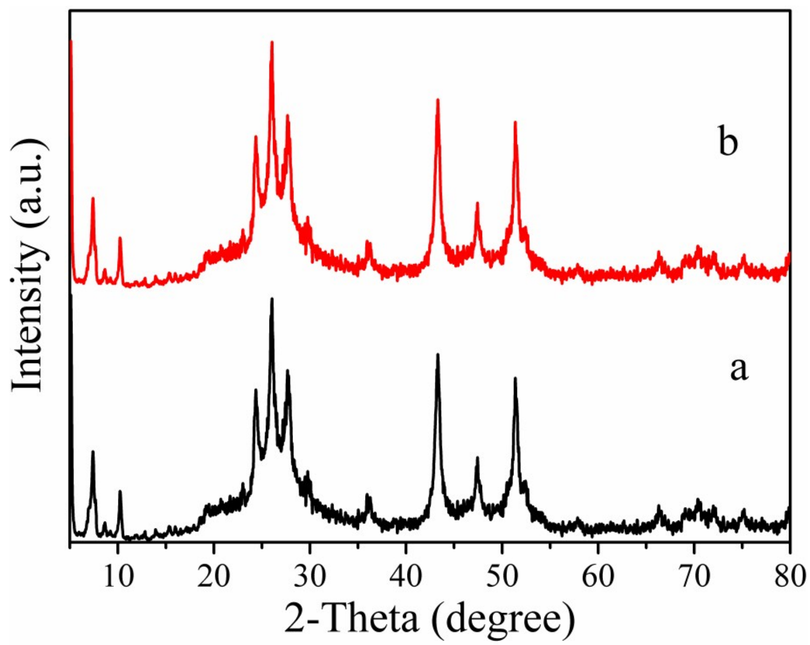


Figure S6. The PXRD patterns of (a) fresh CdS@NU-1000/1%RGO and (b) CdS@NU-1000/1%RGO after water splitting reaction without the addition of sacrificial agents.

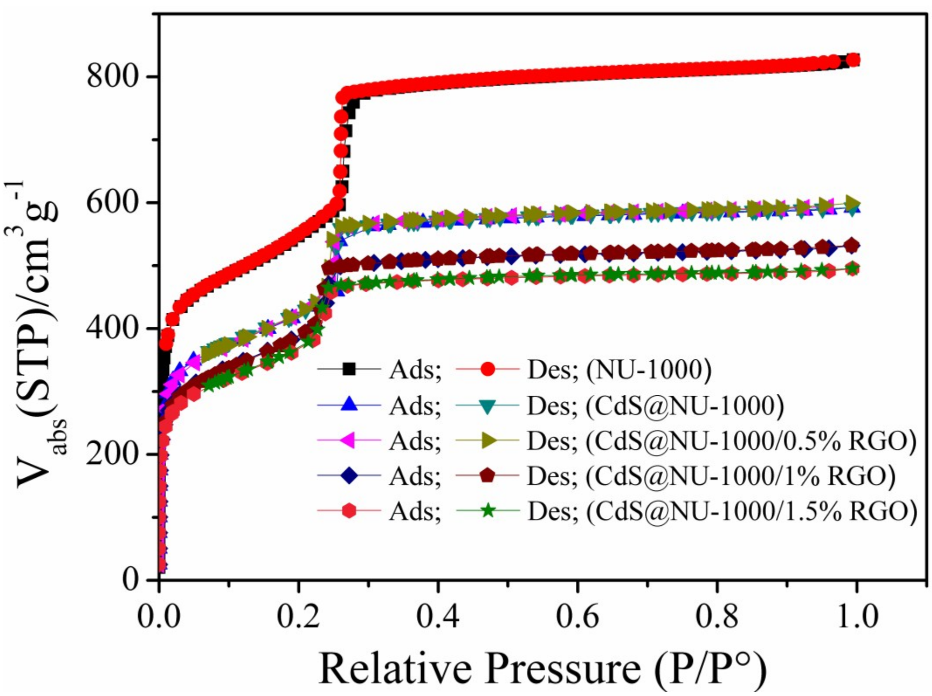


Figure S7 The N_2 adsorption/desorption isotherms.

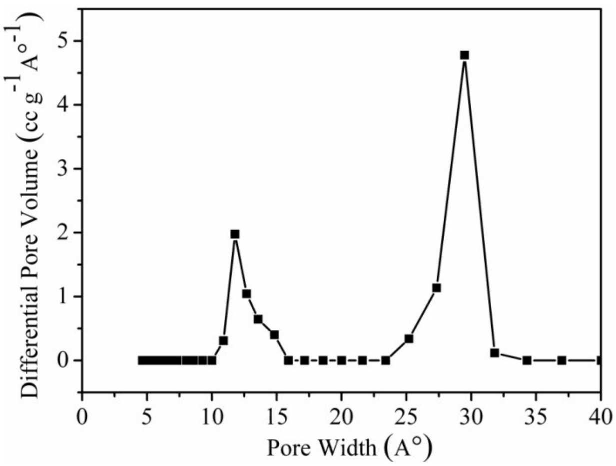


Figure S8 Pore width of NU-1000.

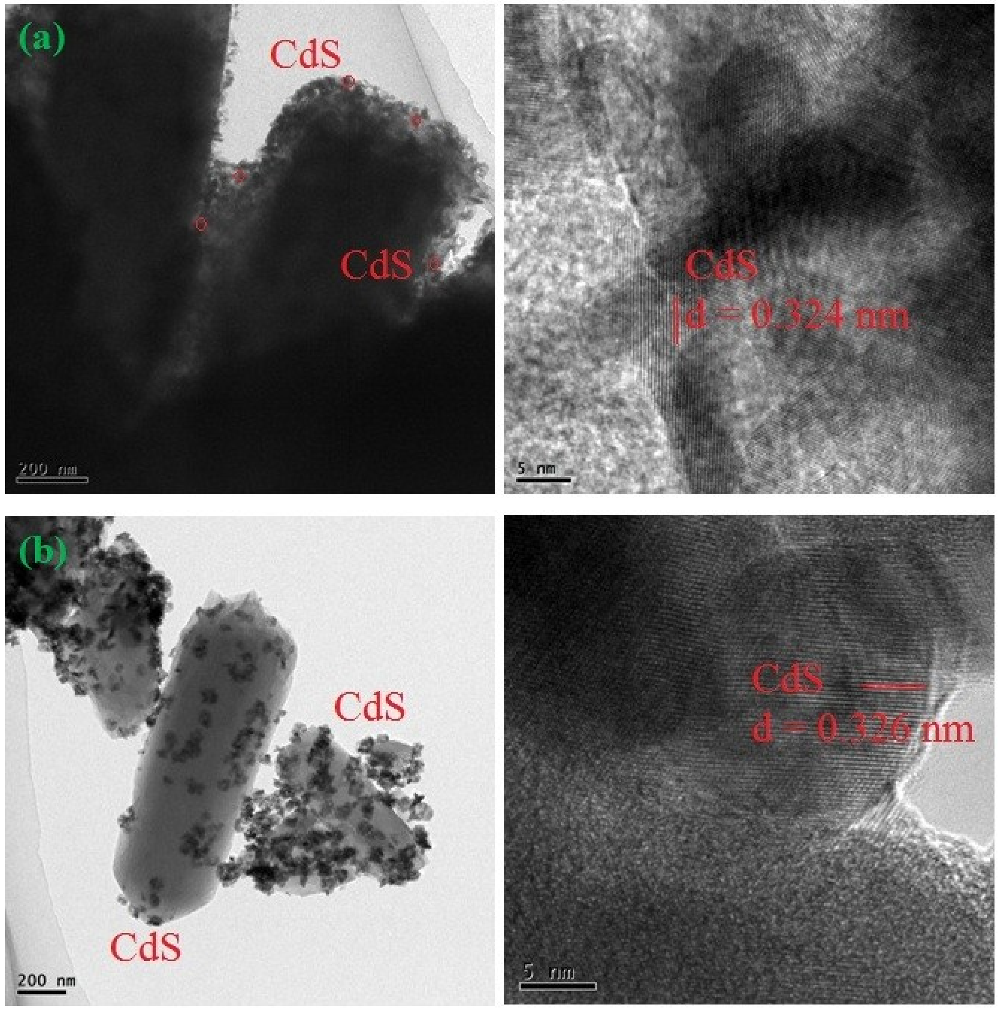


Figure S9. The TEM and HRTEM image of (a) H-CdS@NU-1000/1%RGO and (b) L-CdS@NU-1000/1%RGO.

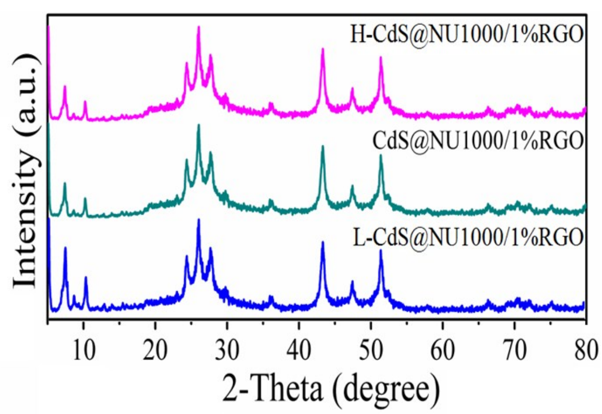


Figure S10. PXRD pattern of all three composite materials.

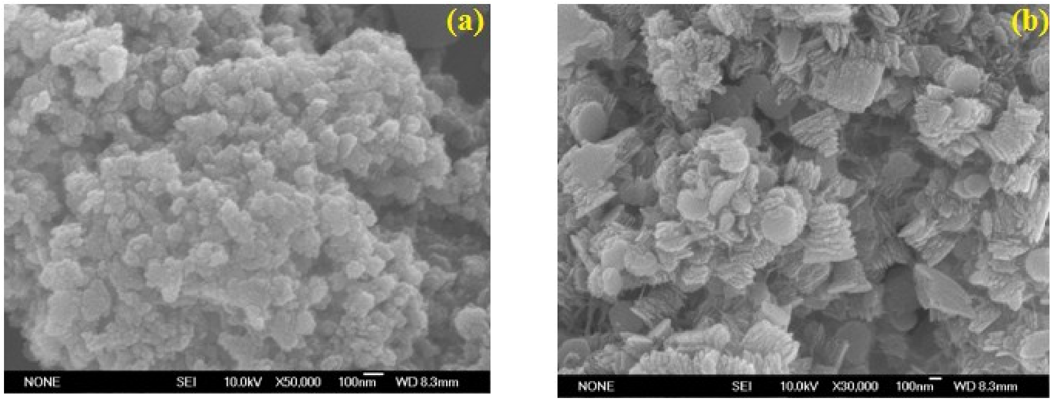


Figure S11.(a) The SEM graph of CdS@NU-1000 and (b)The SEM graph of CdS@NU-1000/1%RGO.

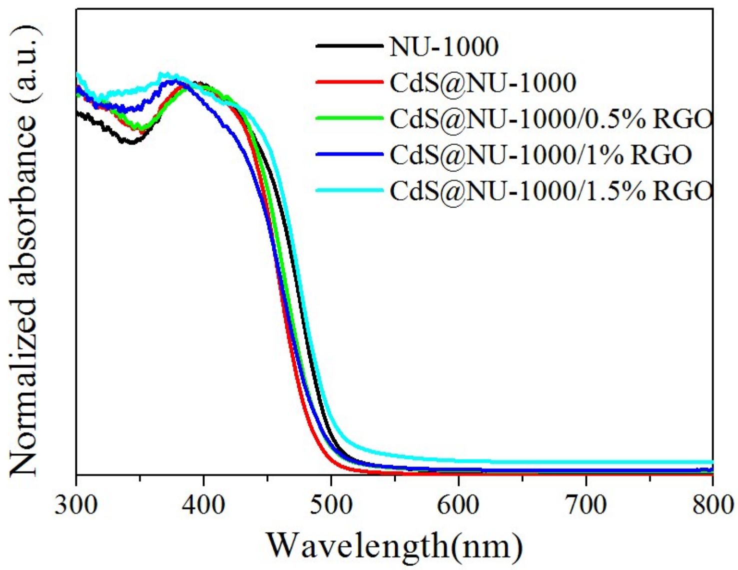


Figure S12. The diffraction reflectance spectra: (a) NU-1000; (b) CdS@NU100/0.5%RGO; (c)CdS@NU-1000; (d)CdS@NU-1000/1%RGO; (e) CdS@NU-1000/1.5%RGO.

Table. S1 The weight ration of CdS and NU-1000 and their activity

Samples	**CdS:NU-1000 (wt/wt)**	**Activity (μmol h^{-1})**	**CdS wt%**	**Activity (mmol g_{CdS}^{-1} h^{-1}) /Times of activity over CdS**
L-CdS@NU-1000/1%RGO	1 : 12.5	5.9	7.39	1.60/**8.0**
CdS@NU-1000/1%RGO	1 : 9.1	12	9.93	2.42/**12.1**
H-CdS@NU-1000/1%RGO	1 : 4.8	8.55	17.36	0.99/**4.95**

Quantum efficiency calculations.

In the following we describe the QE determination at λ_0=420 nm for CdS@NU-1000/1% RGO. The catalyst solution was irradiated by a 300W Xe lamp applying a λ_0±7.5 nm band-pass filter for 4 hours. The average intensity of irradiation was determined to be 163.7 mW·cm^{-2} by a light intensity meter, and the irradiation area was 18.09 cm^2. The number of incident photons (N) is 2.25×10^{22} as calculated by equation (1). The amount of H_2 molecules generated per hour was 2.56 μmol. The quantum efficiency is calculated from equation (2).

$$N=E\lambda/(hc) \qquad (1)$$

$$QE = 2 \times \frac{\text{the number of evolved } H_2 \text{ molecules}}{\text{the number of incident photons}} \times 100\ \% \qquad (2)$$

Table. S2

CdS@NU-1000/1% RGO	Activity (μmol/h)	QE
420 nm	2.56	0.0137%
450 nm	2.24	0.0114%
475 nm	1.63	0.0073%

Table. S3 The mass fraction of CdS in the composite

Samples	Cd wt% (ICP)	S wt% (Elemental Analysis)	CdS wt%
CdS@NU-1000	5.72	4.46	10.18
CdS@NU-1000/1%RGO	5.67	4.26	9.93
L-CdS@NU-1000/1%RGO	4.14	3.25	7.39
M-CdS@NU-1000/1%RGO	11.77	5.59	17.36