Supporting Information

In Situ Construction of Graphdiyne/CuS Heterostructures for Efficient Hydrogen Evolution

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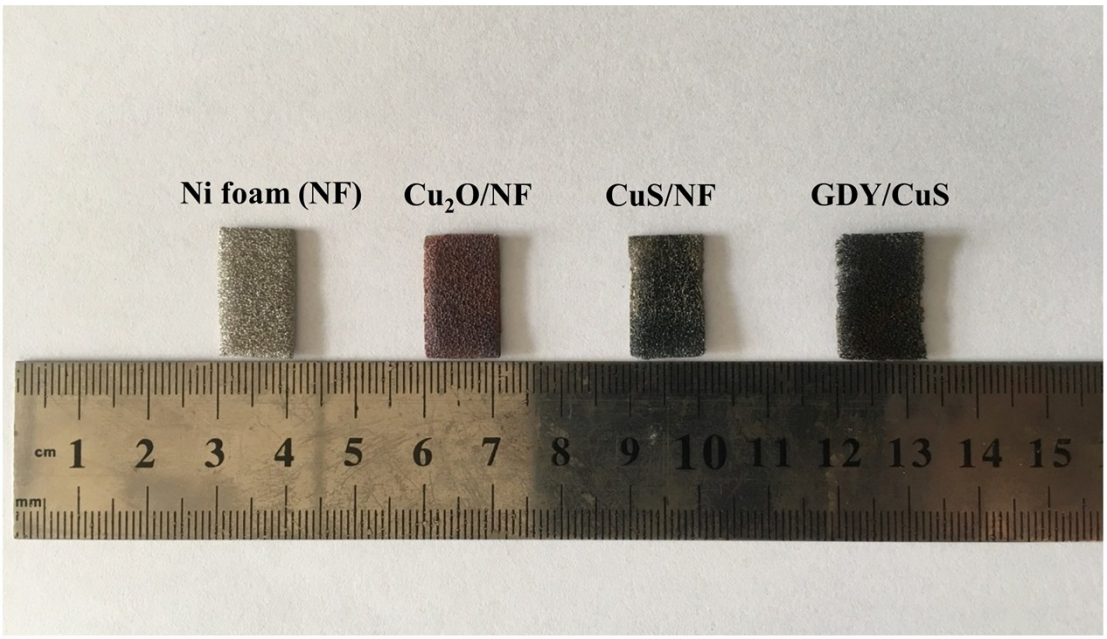

Figure S1. Optical pictures of as-prepared samples.

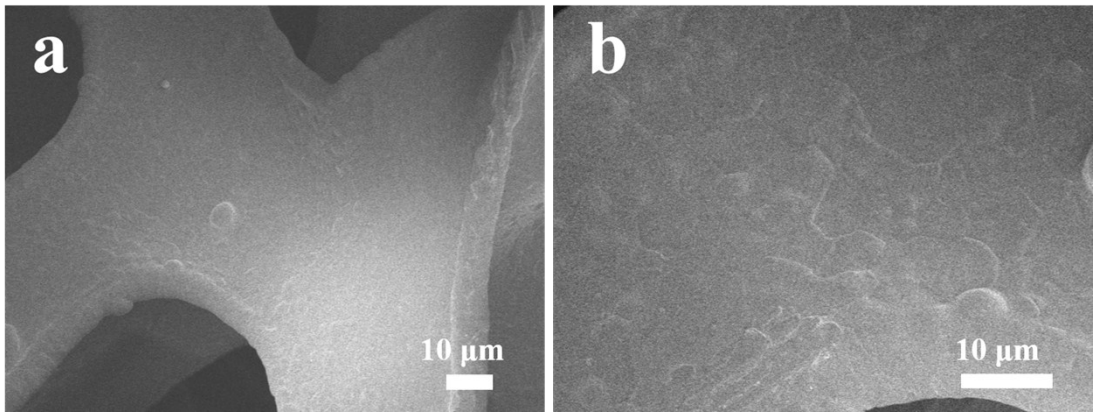

Figure S2. Typical SEM images of the Ni foam.

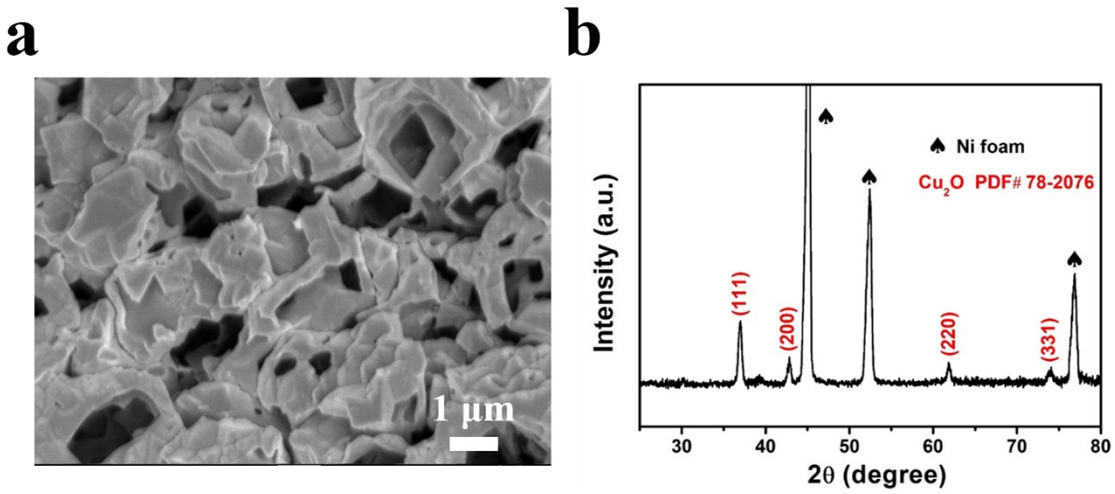

Figure S3. Cu_2O precursor. (a) SEM image and (b) XRD pattern.

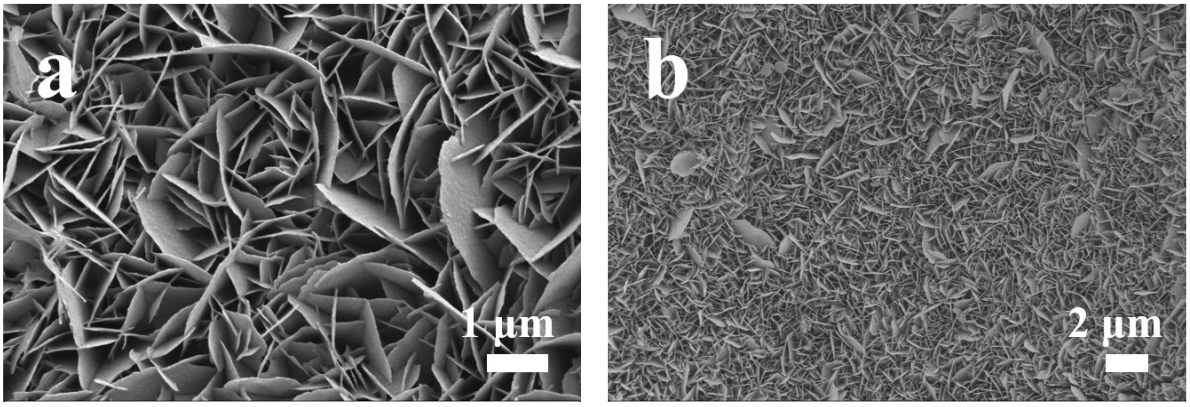

Figure S4. The low solution SEM images of CuS nanosheets.

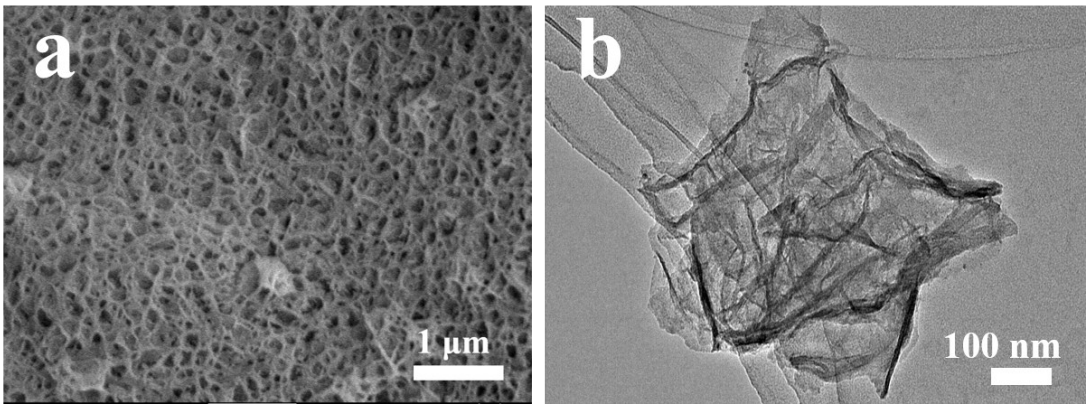

Figure S5. Pure GDY. (a) SEM image and (b) TEM image.

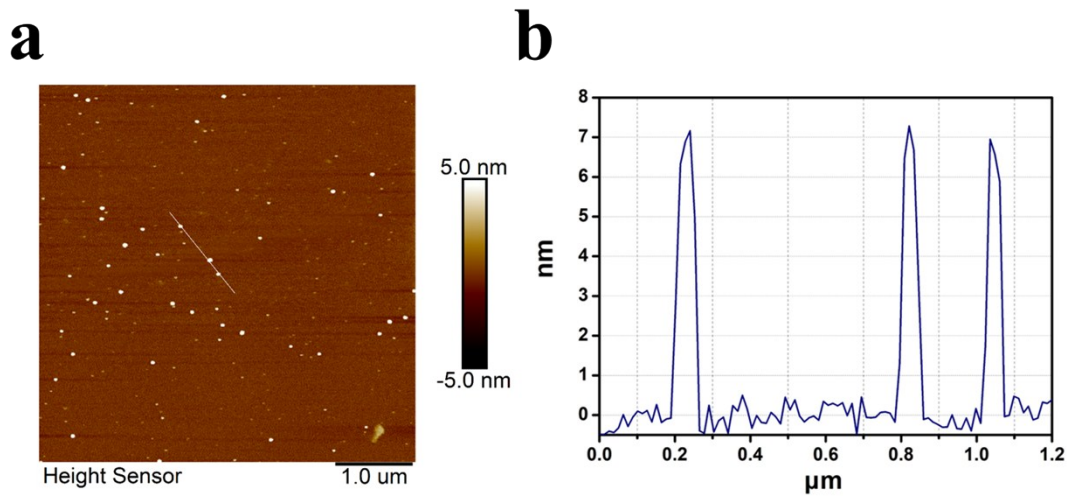

Figure S6. AFM image (a) and corresponding height profiles (b) for GDY/CuS.

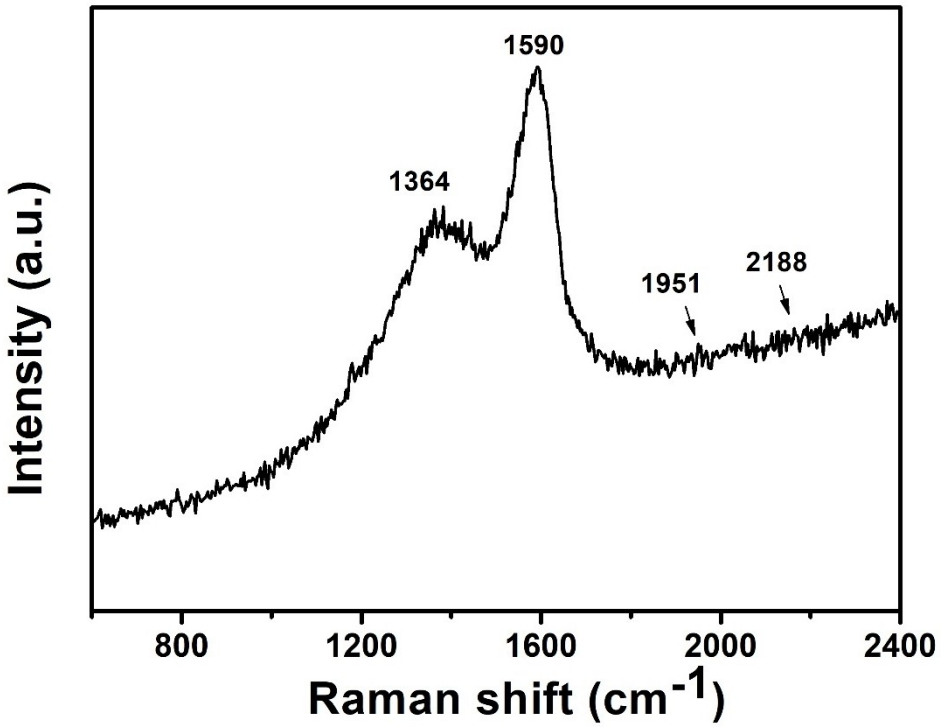

Figure S7. Raman spectrum of pure GDY.

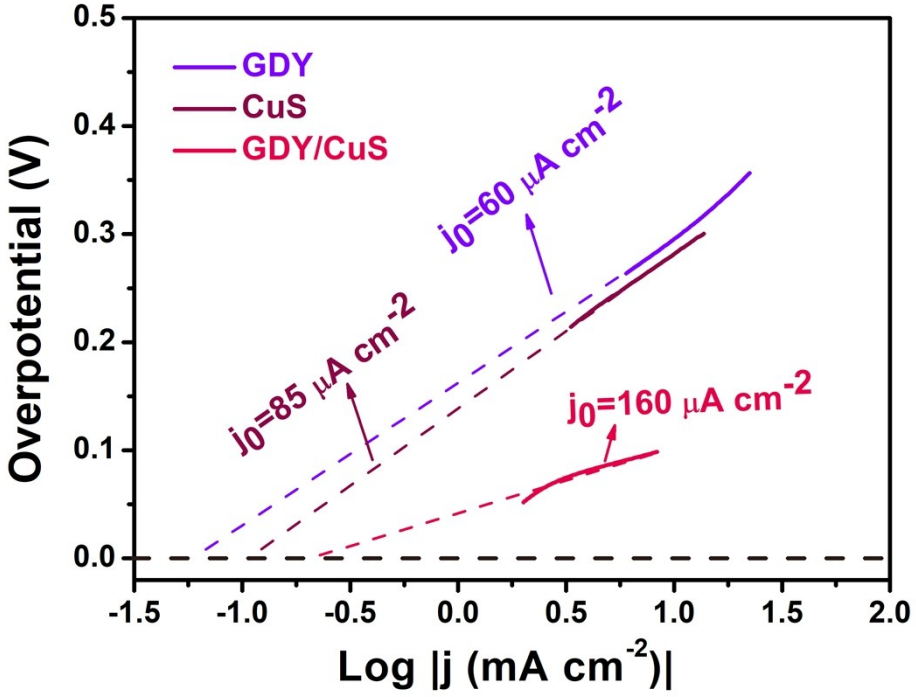

Figure S8. Exchange current density (j_0) of all samples.

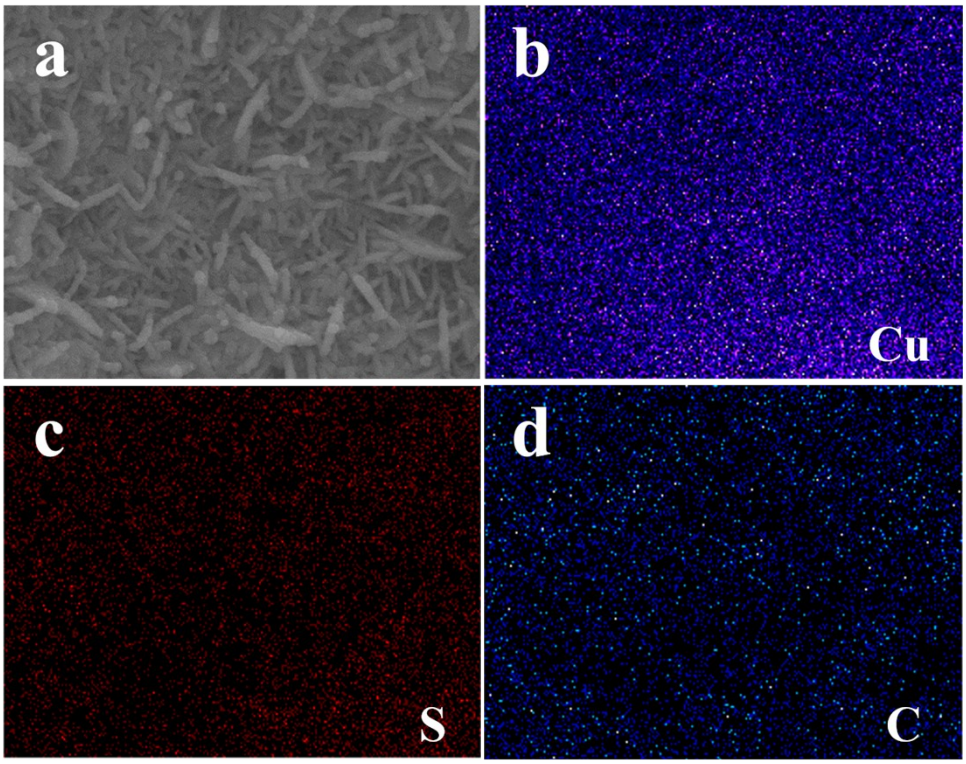

Figure S9.SEM image and corresponding mapping images of GDY/CuS after stability test.

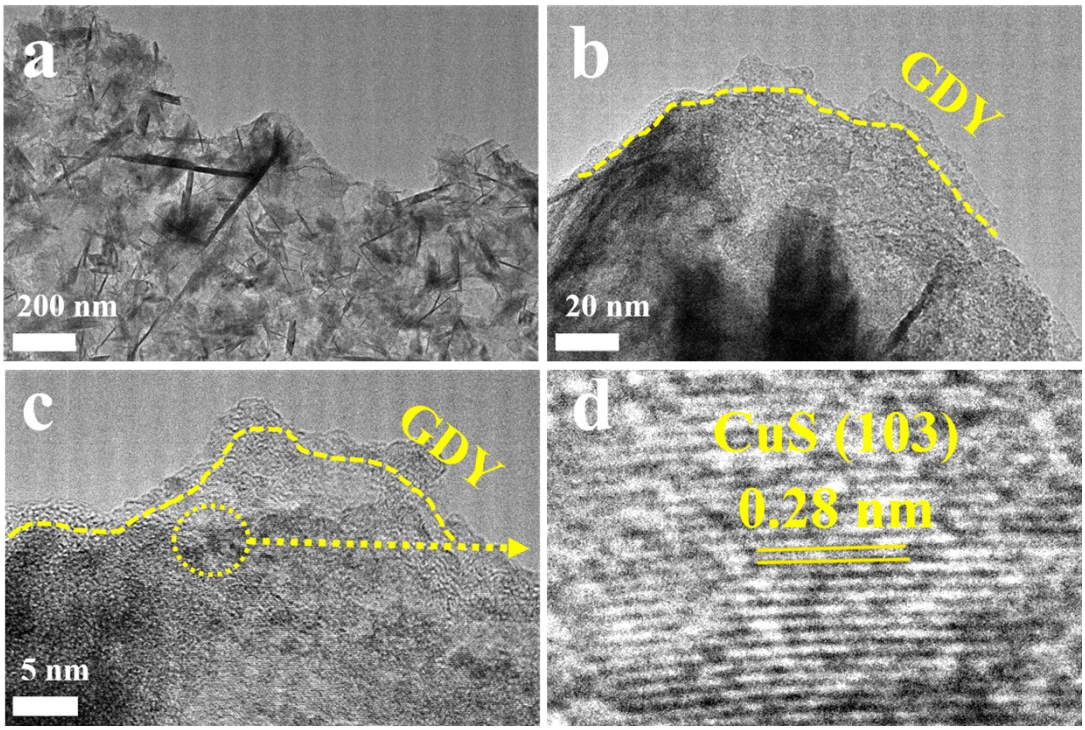

Figure S10.TEM images of GDY/CuS after stability test.

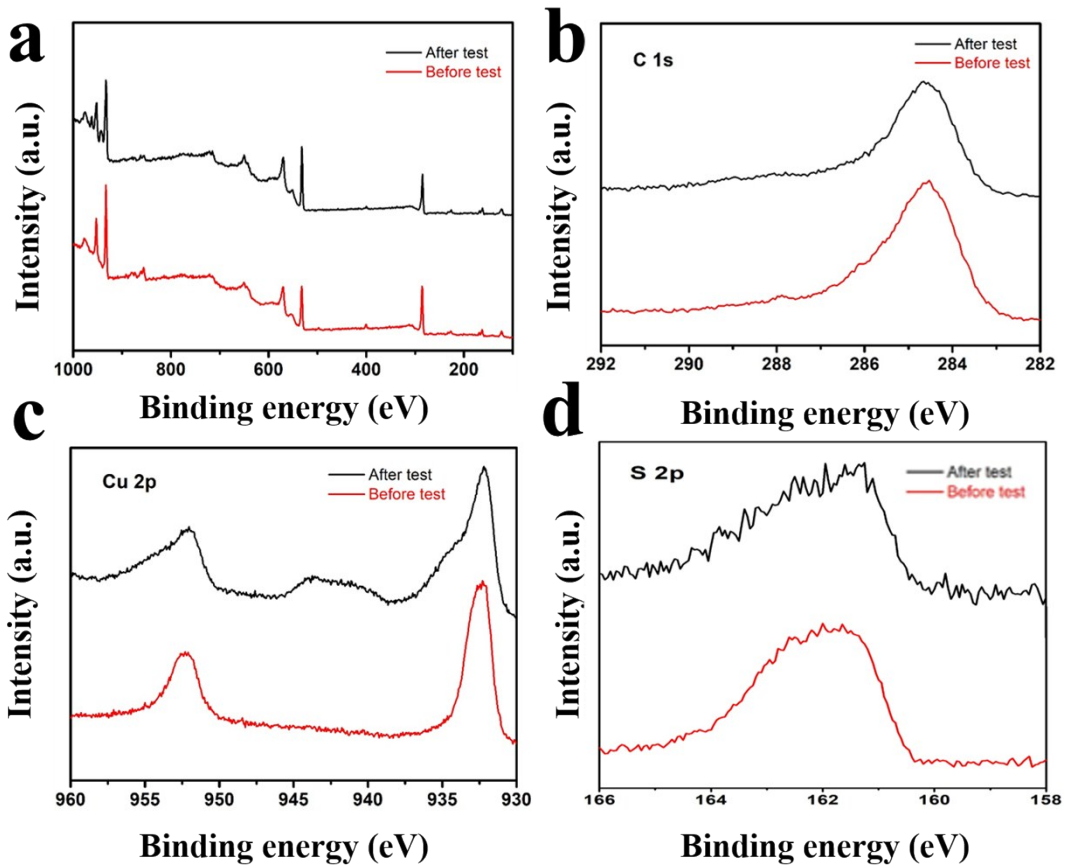

Figure S11. (a) XPS survey, high-resolution XPS spectra of (b) C 1s, (c) Cu 2p, and (d) S 2p of the GDY/CuS electrode before and after stability test.

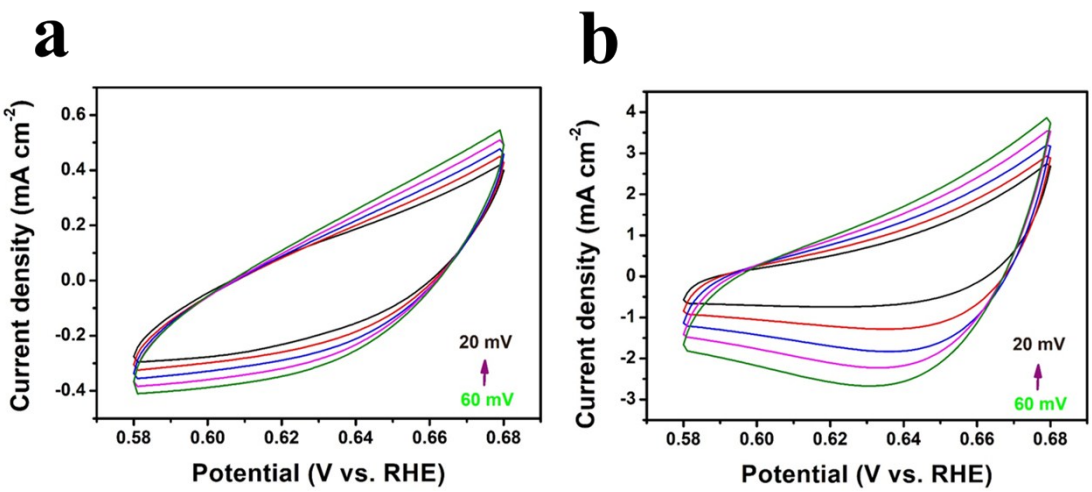

Figure S12. Cyclic voltammograms at different scan rates. (a) GDY, (b) pristine CuS.

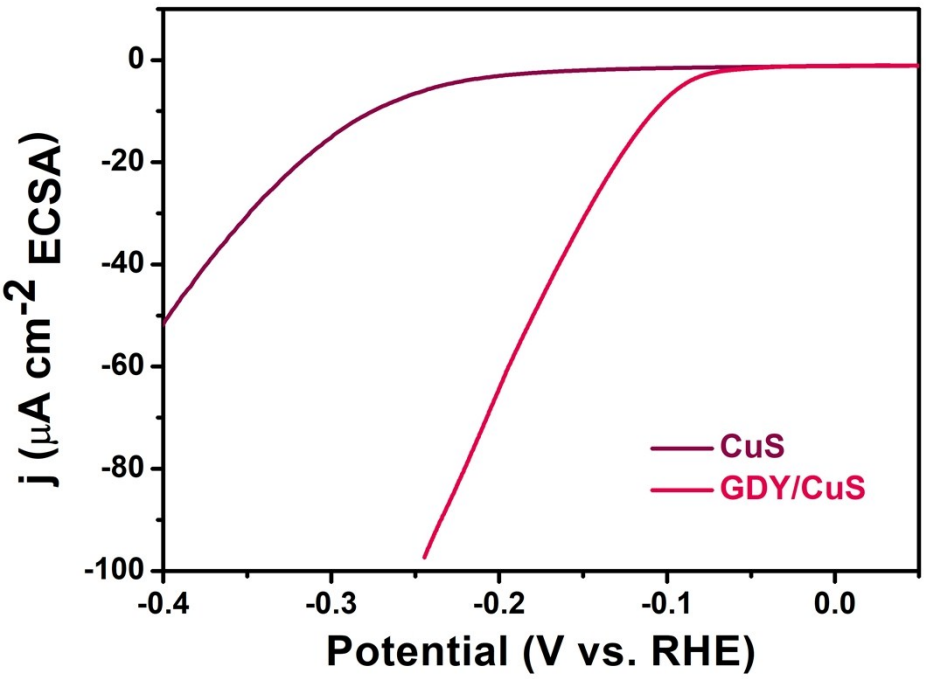

Figure S13. HER polarization curves normalized by the ECSA.

Table S1. Comparison of the HER performance for the GDY/CuS catalyst with other reported electrocatalysts in 1.0 M KOH. Here, η_{10} represent the overpotential at current densities of 10 mA cm^{-2} and j_0 is the exchange current density.

Catalyst	η_{10} (mV)	Tafel slope (mV dec^{-1})	j_0 (μ Acm^{-2})	Reference
GDY/CuS	106	63.8	160	This work
S-MoS_2@C	155	99	NA	*Adv. Energy Mater.* ***2018****, 1802553*
S-CoP/NF	109	79	NA	*Nano Energy.* ***2018****, 53, 286–295*
MoP@NPCS	107	51	127	*Mater. Chem. Front.,* ***2018****, 2, 1987-1996*
NiFeLDH@NiCoP	120	88.2	NA	*Adv. Funct. Mater.* ***2018****, 28, 1706847*
S-CoP/NF	109	79	NA	*Nano Energy.* ***2018****, 53, 286–295*
Co-Ex-MoS_2	89	53	NA	*ACS nano,* ***2018****, 12, 4565-4573*
NiCoN/C	103	NA	NA	*Adv. Mater.* ***2018****, 1805541*
N@$MoPC_X$-800	139	86.6	NA	*Adv. Energy Mater.* ***2018****, 1701601*
CoMoP	81	55.5	260	Energy Environ. Sci., ***2017****,10, 788-798*
$Cu_{0.3}Co_{2.7}P$	220	122	NA	*Adv. Energy Mater.* ***2017****, 1601555*
Mo_XC	151	59	29	*Nature Comm.* ***2015****,6,6512*

Table S2. Impedance parameter values derived from the fitting to the equivalent circuit for the impedance spectra recorded in 1.0 M KOH solution

Samples	Rs (Ω)	CPE	n	R_1 (Ω)	CPE	n	R_2 (Ω)
GDY/CuS	1.43	2.7×10^{-3}	0.71	0.39	9.3×10^{-3}	0.93	9.04
CuS/Ni foam	2.02	9.5×10^{-3}	0.82	11.8	5.1×10^{-2}	0.91	190
GDY/Ni foam	2.61	1.9×10^{-2}	0.67	0.19	3.7×10^{-3}	0.89	2492