Supporting Information

Heterojunction Design between WSe_2 Nanosheets and TiO_2 for Efficient Photocatalytic Hydrogen Generation

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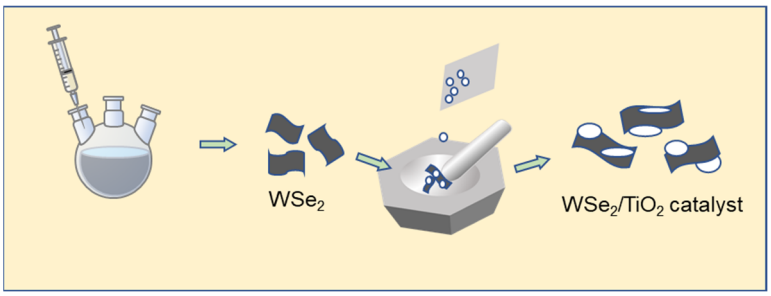

Figure S1. Scheme illustration of synthesis procedure of TW-x catalysts

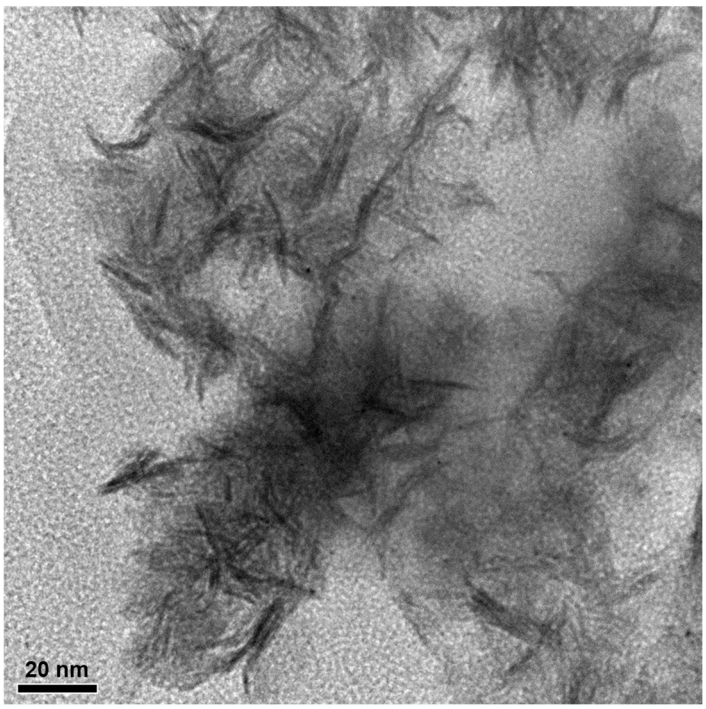

Figure S2. TEM image of WSe_2 nanosheets with low-magnification. The nanosheet was about ~20 nm.

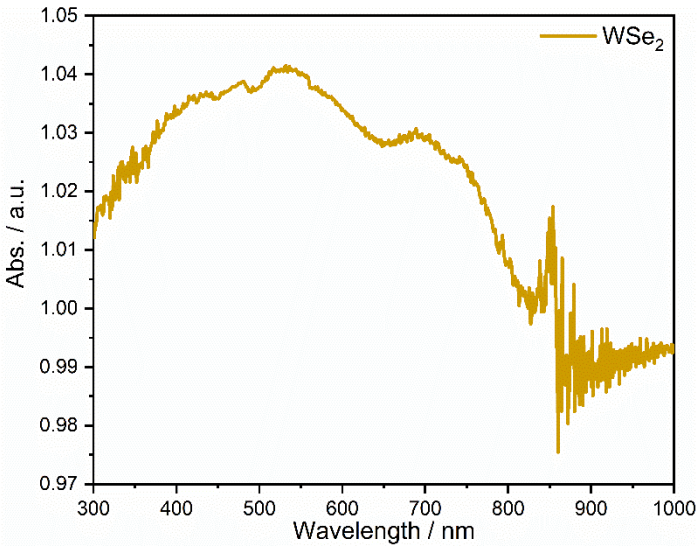

Figure S3. UV-Vis absorption spectra of WSe_2 nanosheets from 300 nm to 1000 nm.

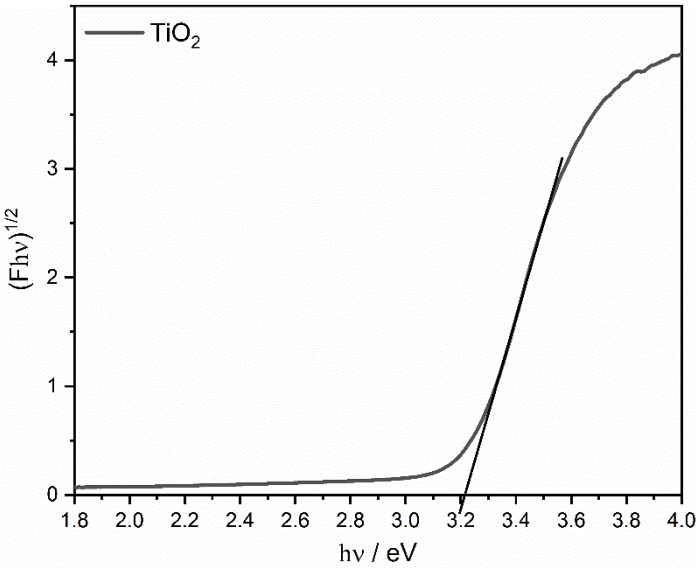

Figure S4. Band-gap evaluation of TiO_2 from Tauc plot.

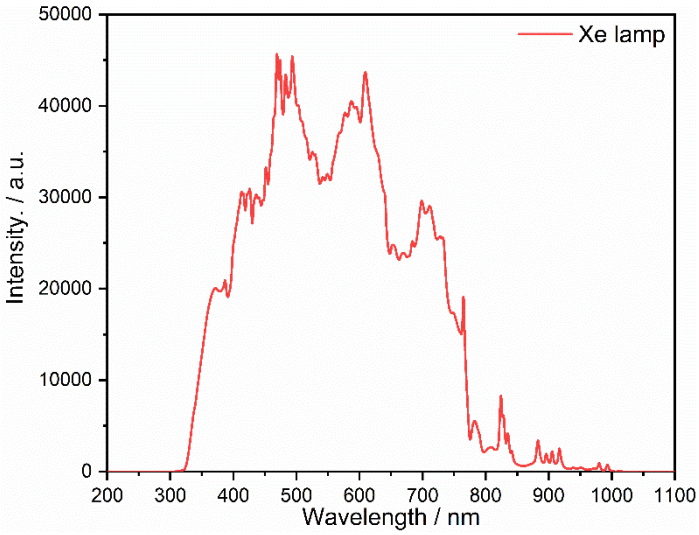

Figure S5. The spectrum of Xe lamp used for light irradiation.

Table S1. Fitting data for photoluminescence emission decay curves using a biexponential function.

Studied Samples	a_1	t_1 (ns)	a_2	t_2 (ns)	Average lifetime
TiO_2	0.82	0.28	0.21	2.10	1.48
TW-2	1.00	0.21	0.22	1.83	1.27

Table S2. Binding energies of studied samples

Binding Energy / eV	TiO_2	TW-2	WSe_2
Ti	458.34	458.36	/
Ti	464.03	464.04	/
O	529.56	529.58	/
O	531.41	531.46	/
W	/	30.65	31.52
W	/	32.87	33.63
W	/	34.66	35.32
W	/	36.59	37.50
Se	/	53.38	54.10

Table S3. Comparison of hydrogen evolution for cocatalysts-TiO_2 photocatalysts.

Photocatalyst	Light source	Sacrificial reagent	Activity (mmol/ g·h)	AQY (365 nm)
$PtAu/TiO_2$	Xe lamp	Methanol	61.5	72.9%[1]
Pt/TiO_2	Xe lamp	Methanol	29.63	45.6%[2]
Pd/TiO_2	365 LED	Ethanol	86.7	14.9%[3]
$NiCuS_x/TiO_2$	365 nm LED	Methanol	8.56	34.67%[4]
$Cu_2(OH)_2CO_3/TiO_2$	Xe lamp	Ethylene glycol	0.50	31.9%[5]
Cu-NW/TiO_2	365 nm LED	Methanol	5.104	17.2%[6]
MoS_2/TiO_2	Xe lamp	Methanol	1.84	13.6%[7]
Ni-NiS_x/TiO_2	365 nm LED	Ethanol	4.47	12.78%[8]
MoS_2/GO/TiO_2	Xe lamp	Ethanol	2.07	9.7%[9]
WSe_2/TiO_2	Xe lamp	Methanol	2.28	43.8%

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