Electronic Supplementary Information

Enhancing photocatalytic H₂ evolution on In₂S₃/mesoporous TiO₂ nanocomposites via one-pot microwave-assisted synthesis using ionic liquid

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Fig. S1 XRD patterns of samples $S_{0.5}$ and S_{mil} .

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Fig. S2 Elements mapping of sample S_{0.5}.



Fig. S3 Recycling photocatalytic H_2 generation test of sample $S_{0.5}$ under the full-arc light irradiation for 50 h.

The operational details for the H_2 generation cycle test of sample $S_{0.5}$ are described as follows: 50 mg of sample $S_{0.5}$ was added directly in the CEL-SPH2N photocatalytic water splitting testing system containing 100 mL of 10 vol% methanol aqueous solution, and irradiated continuously by the 300 W Xe lamp for 50 h. The temperature of reactant solution was maintained at 6 °C by a flow of cooling water during the total photocatalytic process.



Fig. S4 XRD patterns of sample $S_{0.5}$ before and after photocatalytic test for 50 h.

Fable S1	The contents	of In ₂ S ₃	in the	In_2S_3	/mesoporous	TiO ₂	nanocomp	osites	derived	from	the ICP	' data
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Sample	S _{0.05}	S _{0.5}	S ₂	S ₁₆
In/Ti content (wt%)	0.40/59.83	2.88/58.67	11.04/53.16	42.32/26.1
$\frac{In_{2}S_{3} \text{ content (mol \%)}}{[n(In_{2}S_{3}) / (n(TiO_{2}) + n(In_{2}S_{3}))]}$	0.14	1.01	4.15	25.27

Table S2	Calculated	results for	the band	positions	of mesoporous	TiO ₂ and	In_2S_3
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Compound	E _{fb} V, vs. Ag/AgCl	E _{fb} V, vs. NHE	E _{CB} V, vs. NHE	E _{VB} V, vs. NHE	E _{CB} eV, vs. Vacuum Level	E _{VB} eV, vs. Vacuum Level
mesoporous TiO ₂	-0.43	-0.23	-0.33	3.04	-4.11	-7.48
In_2S_3	-0.82	-0.62	-0.72	1.25	-3.72	-5.69

With Ag/AgCl electrode as the reference electrode, relative to the NHE potential of 0.20 V, the formula for calculation level:

$$\begin{split} E_{fb} (V, vs. NHE) &= E_{fb} (V, vs. Ag/AgCl) + 0.20V \\ E_{CB} (V, vs. NHE) &= E_{fb} (V, vs. NHE) - 0.1V \\ E_{CB} (eV, vs. Vacuum Level) &= - E_{CB} (V, vs. NHE) - 4.44 (at 298K) \\ E_{VB} (eV, vs. Vacuum Level) &= E_{CB} (eV, vs. Vacuum Level)] - E_{BG} \\ E_{VB} (V, vs. NHE) &= -E_{VB} (eV, vs. Vacuum Level) - 4.44 (at 298K) \end{split}$$

For mesoporous TiO₂,

$$\begin{split} E_{fb} (V, vs. NHE) &= E_{fb} (V, vs. Ag/AgCl) + 0.20V = -0.43 V + 0.20 V = -0.23 V \\ E_{CB} (V, vs. NHE) &= E_{fb} (V, vs. NHE) - 0.1 V = -0.33 V \\ E_{CB} (eV, vs. Vacuum Level) &= - E_{CB} (V, vs. NHE) - 4.44 (at 298K) = -4.11 eV \\ E_{VB} (eV, vs. Vacuum Level) &= E_{CB} (eV, vs. Vacuum Level)] - E_{BG} = -7.48 eV \\ E_{VB} (V, vs. NHE) &= - E_{VB} (eV, vs. Vacuum Level) - 4.44 (at 298 K) = 3.04 V \end{split}$$

For In₂S₃,

$$\begin{split} E_{fb} (V, vs. NHE) &= E_{fb} (V, vs. Ag/AgCl) + 0.20V = -0.82 V + 0.20 V = -0.62 V \\ E_{CB} (V, vs. NHE) &= E_{fb} (V, vs. NHE) - 0.1 V = -0.72 V \\ E_{CB} (eV, vs. Vacuum Level) &= - E_{CB} (V, vs. NHE) - 4.44 (at 298K) = -3.72 eV \\ E_{VB} (eV, vs. Vacuum Level) &= E_{CB} (eV, vs. Vacuum Level)] - E_{BG} = -5.69 eV \\ E_{VB} (V, vs. NHE) &= - E_{VB} (eV, vs. Vacuum Level) - 4.44 (at 298 K) = 1.25 V \end{split}$$