

## Supporting Information

### **Band structure engineering of polyimide photocatalyst towards enhanced water splitting**

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**Table S1.** Physicochemical properties and photocatalytic H<sub>2</sub> and O<sub>2</sub> evolution rate of AM-PI and AD-PI with visible light irradiation.

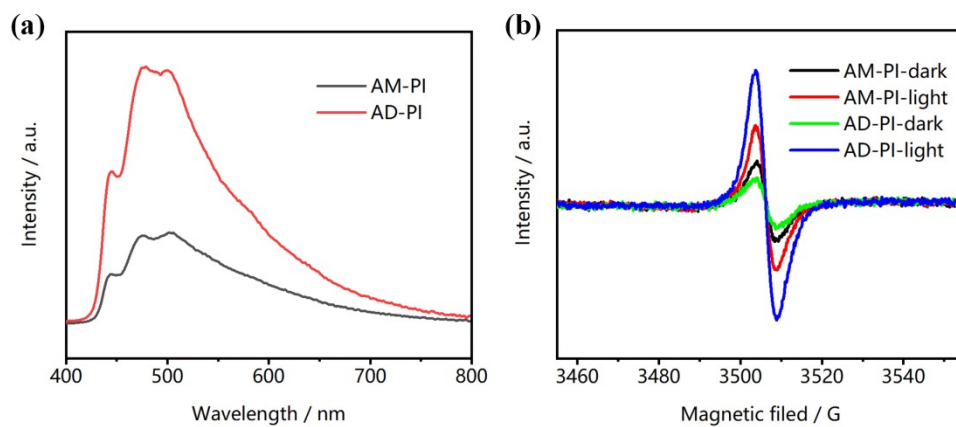
Sample	Surface area (m <sup>2</sup> /g)	Gas evolution rate ( $\mu\text{mol/h}$ )		Specific activity of gas evolution rate ( $\mu\text{mol}\cdot\text{g}/(\text{m}^2\cdot\text{h})$ )	
		H <sub>2</sub>	O <sub>2</sub>	H <sub>2</sub>	O <sub>2</sub>
AM-PI	5.1	15.2	0.4	3.0	0.08
AD-PI	1.9	4.0	0.7	2.1	0.37

**Table S2.** Performance comparison of PI with other reported PIs and g-C<sub>3</sub>N<sub>4</sub> for photocatalytic hydrogen evolution and oxygen evolution.

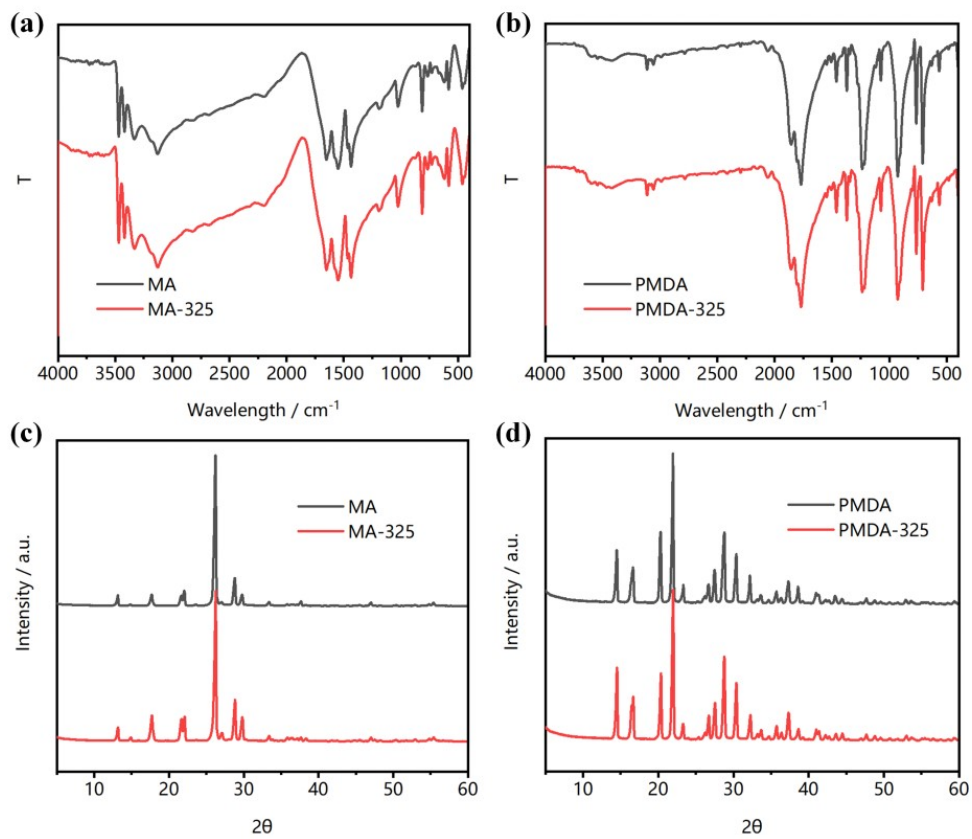
Photocatalyst	Sample preparation condition	Hydrogen evolution rate (μmol/h)	Oxygen evolution rate (μmol/h)	Reference
AM-PI	MA:PMDA=1:1, 325 °C	15.2	0.4	This work
AD-PI	MA:PMDA=1:2, 325 °C	4	0.7	This work
PI-300	MA:PMDA=1:1, 300 °C	5.3	/	1
PI-350	MA:PMDA=1:1, 350 °C	9.6	/	1
melem	MA, 425 °C	1.9	/	2
PI-BP	melem:BPDA=1:1, 325 °C	1.2	/	2
PI-NT	melem:NTDA=1:1, 325 °C	1.3	/	2
PI	melem:PMDA=1:1, 325 °C	20.6	7.7	3
g-C <sub>3</sub> N <sub>4</sub>	MA, 550 °C	7	0.8	3

H<sub>2</sub> evolution condition: 10 vol% methanol, 1 wt% Pt-deposited, λ>420 nm.

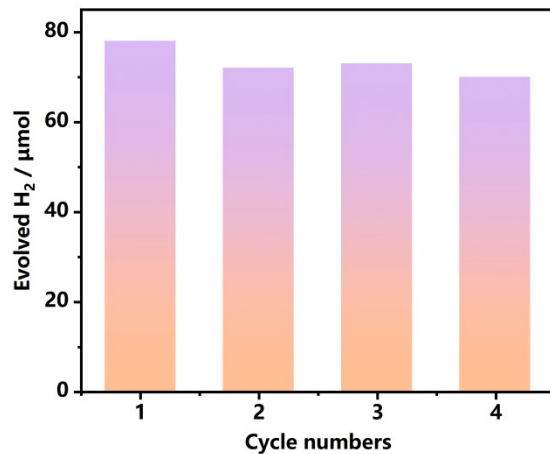
O<sub>2</sub> evolution condition: 0.01 M AgNO<sub>3</sub>, λ>420 nm.



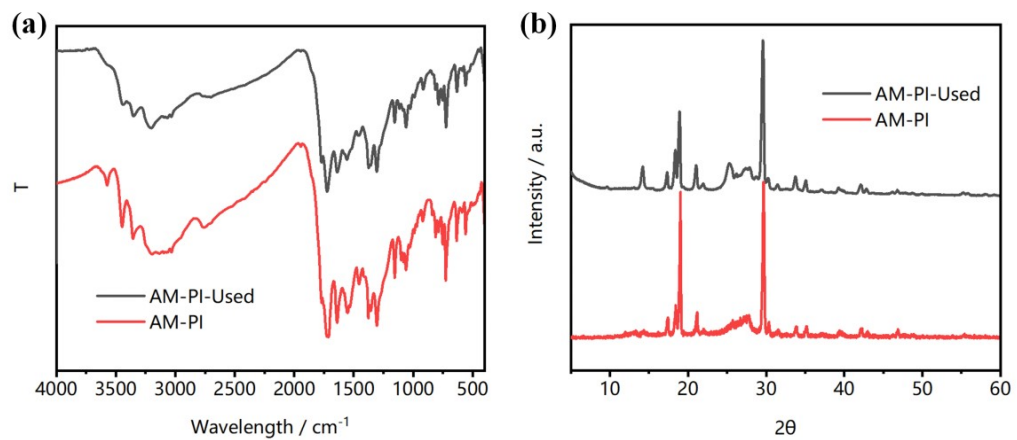
**Figure S1.** (a) PL spectra (excitation at  $\lambda=325$  nm) and (b) ESR spectra in dark and in visible light irradiation ( $\lambda>420$  nm, a 300 W Xe lamp) of AM-PI and AD-PI.



**Figure S2.** FTIR spectra of (a) MA and MA-325, (b) PMDA and PMDA-325, XRD spectra of (c) MA and MA-325, (d) PMDA and PMDA-325.



**Figure S3.** Recycle experiments of H<sub>2</sub> evolution from a 10 vol % aqueous methanol solution by 1 wt% Pt-deposited AM-PI, Reaction conditions: 100 mg of AM-PI, visible light irradiation ( $\lambda > 420$  nm), 5 h.



**Figure S4.** (a) FTIR and (b) XRD spectra of AM-PI before and after hydrogen evolution cycle experiments.

## References

- 1 S. Chu, Y. Wang, Y. Guo, P. Zhou, H. Yu, L. Luo, F. Kong, Z. Zou, Facile green synthesis of crystalline polyimide photocatalyst for hydrogen generation from water, *J. Mater. Chem.*, 2012, **22**, 15519.
- 2 S. Chu, Y. Wang, C. Wang, J. Yang, Z. Zou, Bandgap modulation of polyimide photocatalyst for optimum H<sub>2</sub> production activity under visible light irradiation, *Int. J. Hydrogen Energy*, 2013, **38**, 10768-10772.
- 3 S. Chu, Y. Wang, Y. Guo, J. Feng, C. Wang, W. Luo, X. Fan, Z. Zou, Band structure engineering of carbon nitride: In search of a polymer photocatalyst with high photooxidation property, *ACS Catal.*, 2013, **3**, 912-919.