

Supporting Information

Phosphorus-Doped Inverse Opal $g\text{-C}_3\text{N}_4$ for Efficient and Selective CO Generation from Photocatalytic Reduction of CO_2

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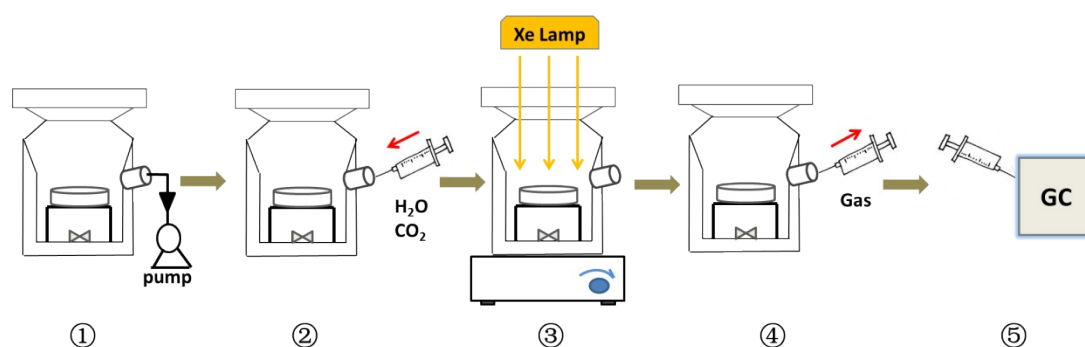


Figure S1. CO₂ photoreduction flowchart (1. Evacuate the reactor; 2. Inject 1 mL ultrapure water and 200 mL CO₂ into the reactor; 3. Irradiate the catalyst with Xe lamp for 4 h; 4. Extract 5 mL of reacted gas; 5. Inject gas into GC for analysis).

The calculation of the evolution rate of CO is according to Eqs. S1:

$$\text{CO evolution rate} = \frac{s}{S_0} * \frac{C_0 V_0}{22.4mt} \quad (\text{S1})$$

- s*: Peak area of CO in the react gas in GC;
- S₀*: Peak area of CO in standard gas in GC;
- C₀*: Standard gas concentration (ppm);
- V₀*: The volume of the reactor (L);
- m*: The quality of the catalyst (g);
- t*: The time of irradiation (h).

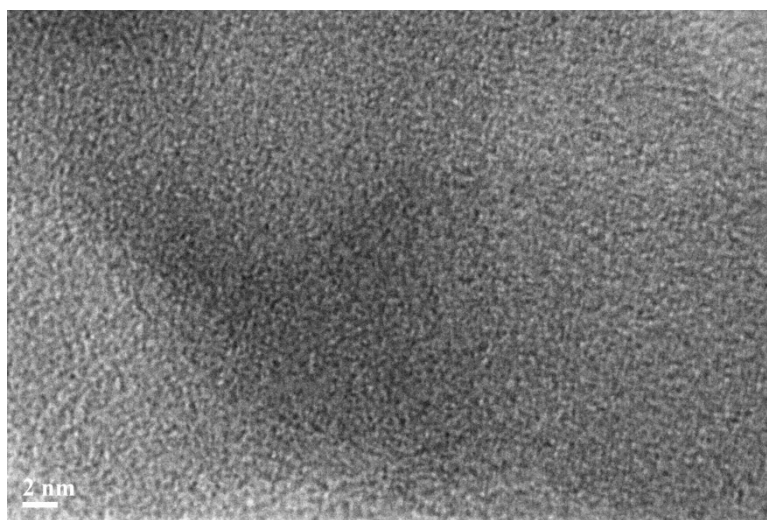


Figure S2. HRTEM images of P-IOCN

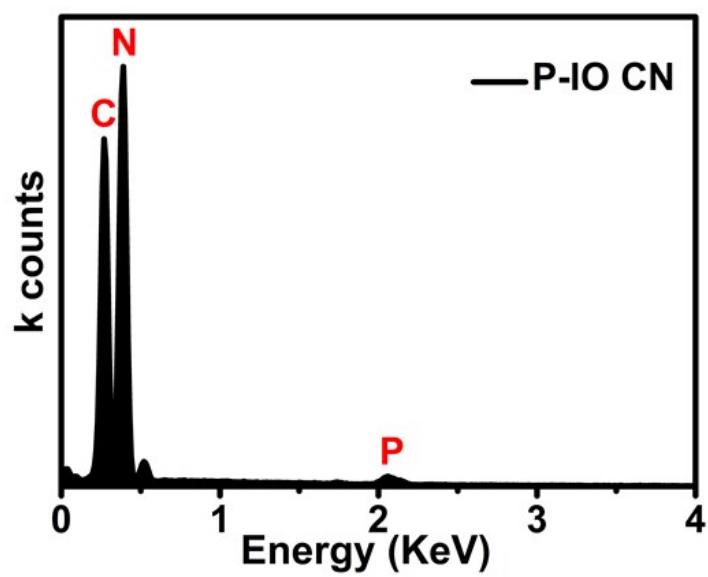


Figure S3. EDS analysis of P-IOCN

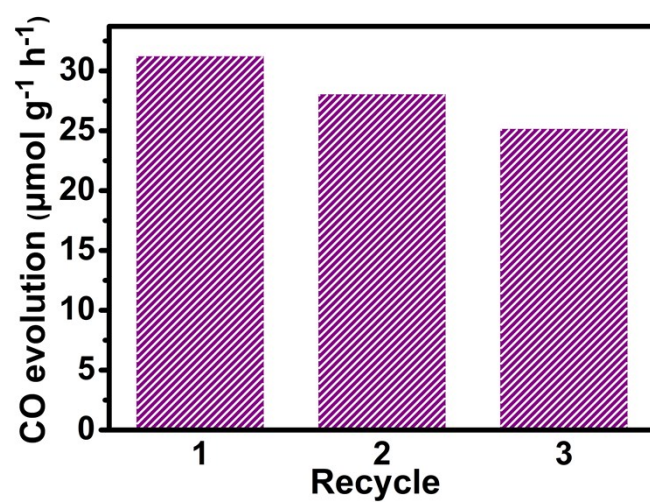


Figure S4. Cycling tests of photocatalytic CO₂ reduction into CO over P-IOCN

Table S1. Specific surface area and pore volume of the photocatalysts

Catalyst	Surface Area(m ² /g)	Pore Volume(cm ³ /g)
Bulk CN	3.89	0.034556
IO CN	34.19	0.145081
P-IO CN	19.88	0.123472

Table S2. Elemental analysis and ICP-AES of P-IOCN

Catalyst	N (wt%)	C (wt%)	P (wt%)	C/N (wt%)
IO CN	52.14	32.73	0	0.6277
P-IO CN	52.12	32.09	0.68	0.6156

Table S3. Comparison of CO₂ photoreduction activity of the P-IO CN with other reported photocatalysts.

Catalyst	Catalyst amount (mg); Reaction solution	Light source	Evolution rate ($\mu\text{mol g}^{-1} \text{h}^{-1}$)	Reference
P-IO CN	30 mg H ₂ O (1 mL)	300 W Xe lamp	CO: 31.22	This work
α -Fe ₂ O ₃ /g-C ₃ N ₄	25 mg H ₂ SO ₄ (5 mL, 4 M)	300 W Xe lamp	CO: 27.2	1
Ti ₃ C ₂ MXene/ g-C ₃ N ₄	20 mg NaHCO ₃ (1.26 g) H ₂ SO ₄ (4 mL, 2 M)	300 W Xe lamp with 420 nm filter	CO: 5.2	2
Flower-like g-C ₃ N ₄	30 mg H ₂ O (0.5 mL)	300 W Xe lamp	CO: 18.8	3
ZnO/g-C ₃ N ₄	100 mg NaHCO ₃ (0.12 g) HCl (0.25 mL, 4 M)	500 W Xe lamp with 420 nm filter	CO: 29	4
CoZnAl- LDH/RGO/g-C ₃ N ₄	50 mg H ₂ O (0.4 mL)	300W Xe lamp	CO: 10.1	5
CQDs/g-C ₃ N ₄	20 mg water vapor	300W Xe lamp with 400 nm filter	CO: 23.4	6
WO ₃ /g-C ₃ N ₄	30 mg H ₂ O (95 mL) TEOA (5 mL)	300W Xe lamp with 420 nm filter	CO: 14.6	7

Notes and references

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