

Pyrolysis-Tuned Carbon Nitride with Synergistic K-Bridged Channels and Vacancies for Boosting H₂O₂ Production and Tetracycline Degradation

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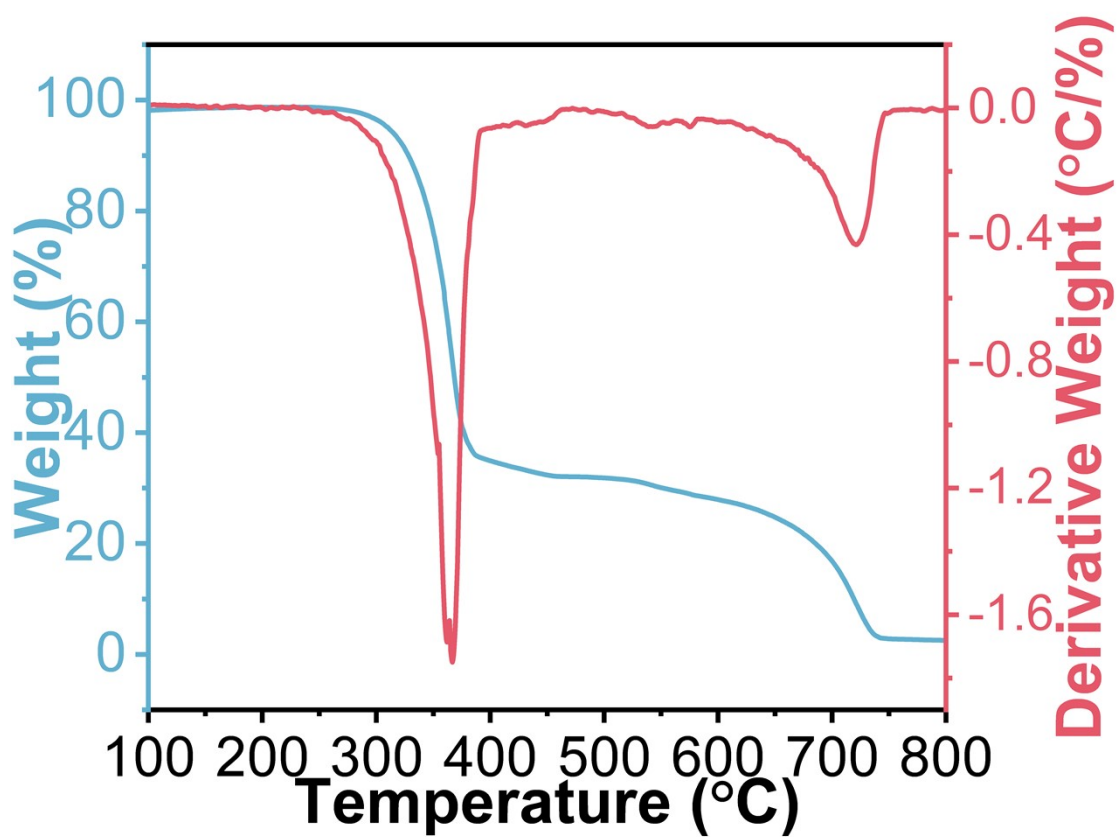


Fig. S1 TG and DTA curves of CN precursor.

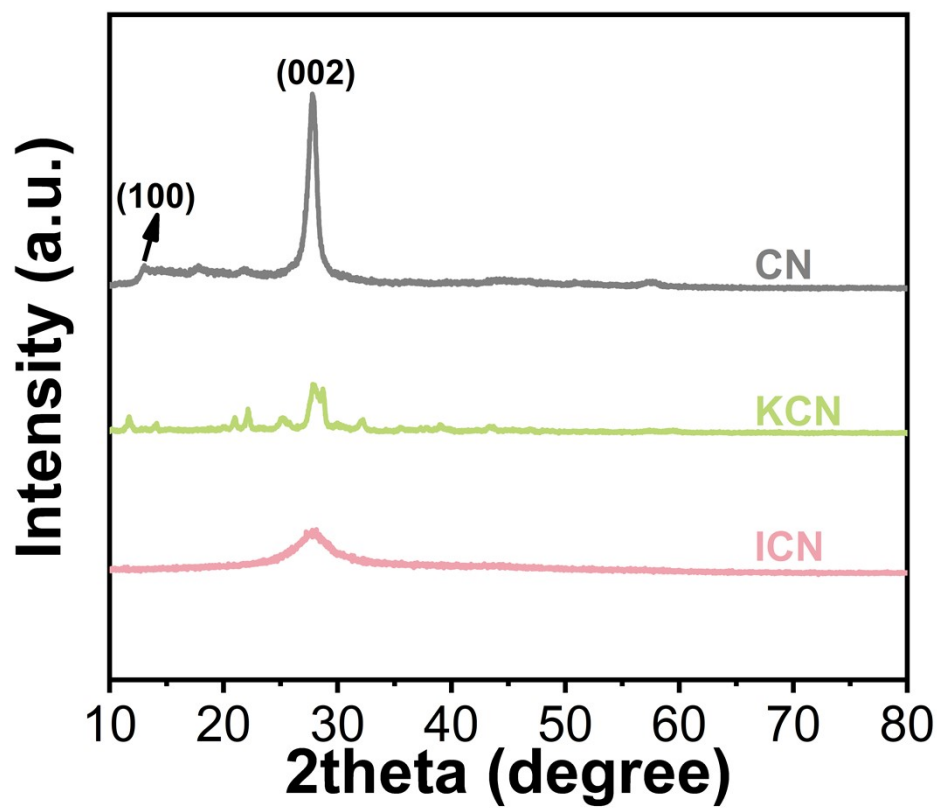


Fig. S2 XRD patterns of CN, KCN and ICN.

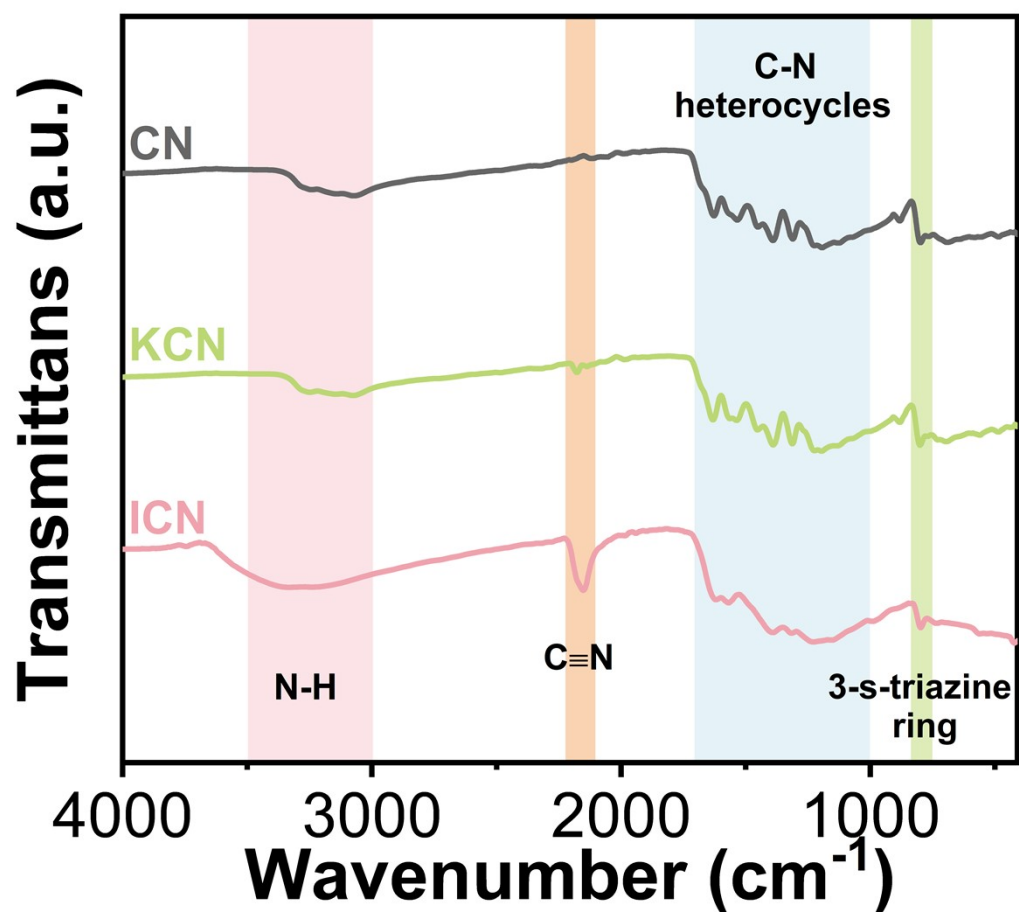


Fig. S3 FTIR spectra of CN, KCN and ICN.

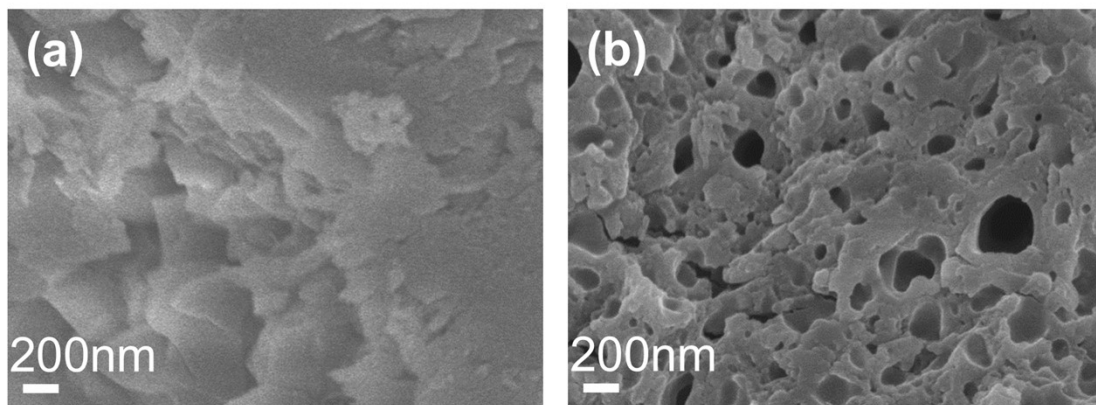


Fig. S4 SEM images of KCN (a) and ICN (b)

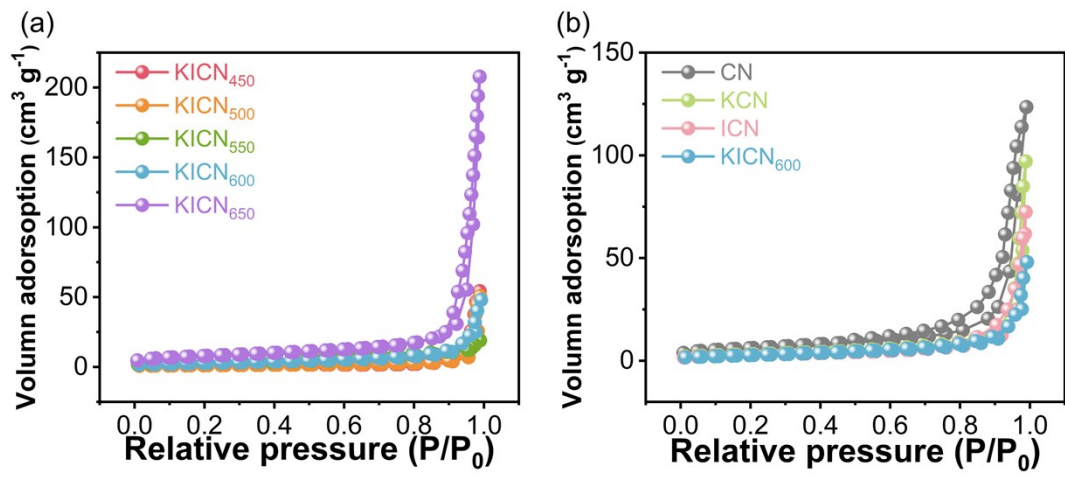


Fig. S5 Comparison of N₂ adsorption-desorption isotherms for KICN_T (T = 450, 500, 550, 600 and 650°C) (a); Comparison of N₂ adsorption-desorption isotherms for CN, KCN, ICN, and KICN₆₀₀ (b).

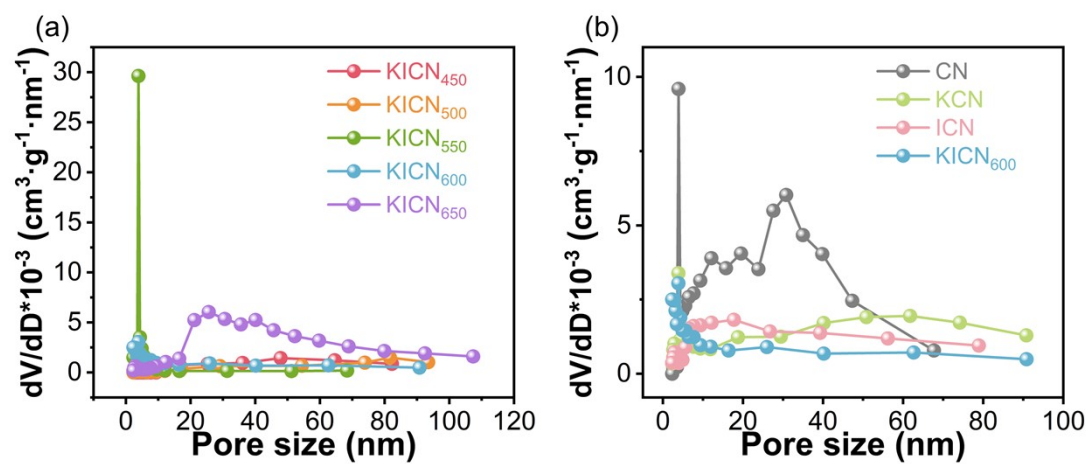


Fig. S6 Comparison of BJH pore size distributions for KICN_T (T = 450, 500, 550, 600 and 650°C) (a); Comparison of BJH pore size distributions for CN, KCN, ICN, and KICN₆₀₀ (b).

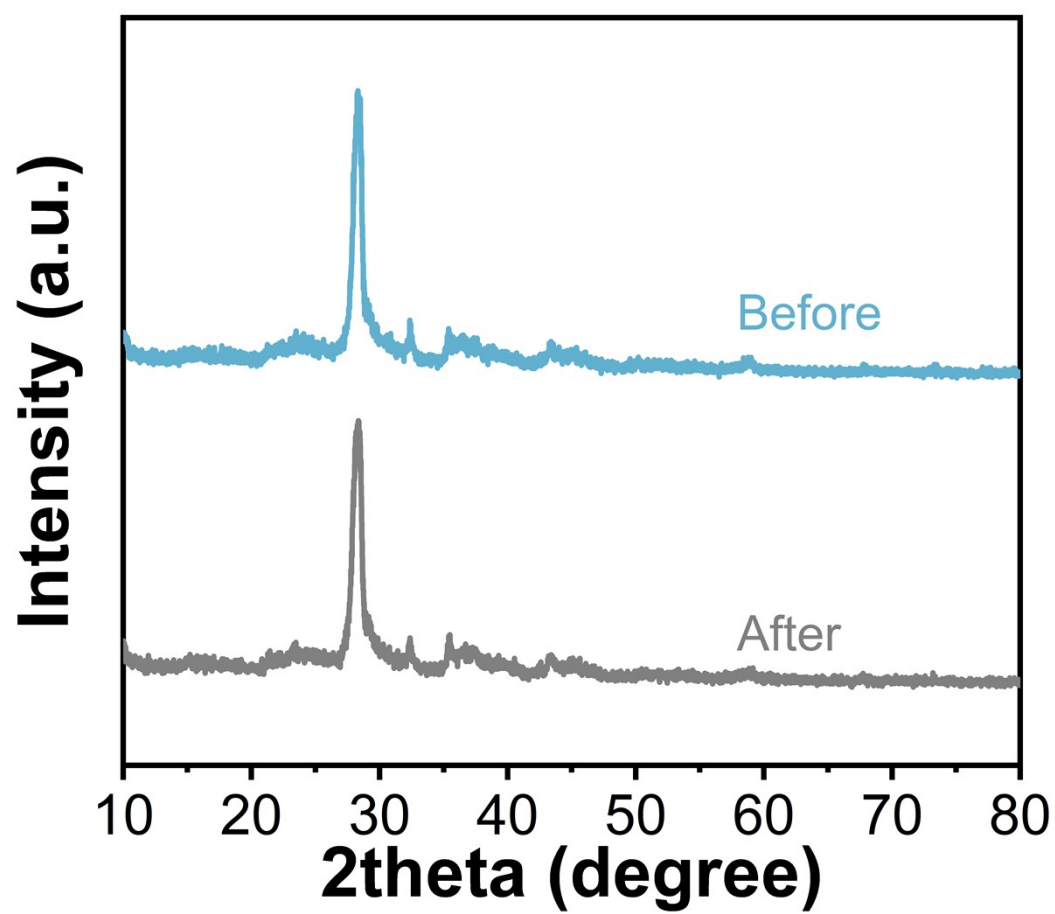


Fig. S7 XRD patterns of KICN₆₀₀ before and after reactions.

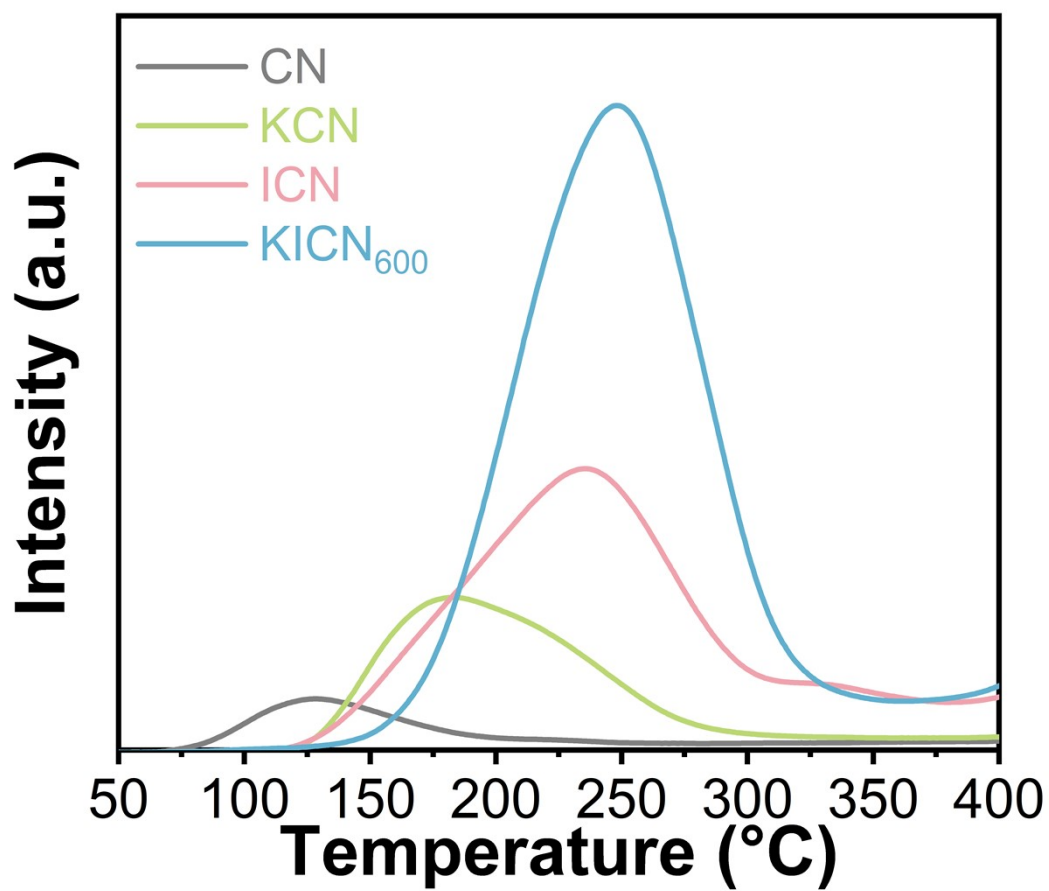


Fig. S8 O₂-TPD curves for CN, KCN, ICN, and KICN₆₀₀

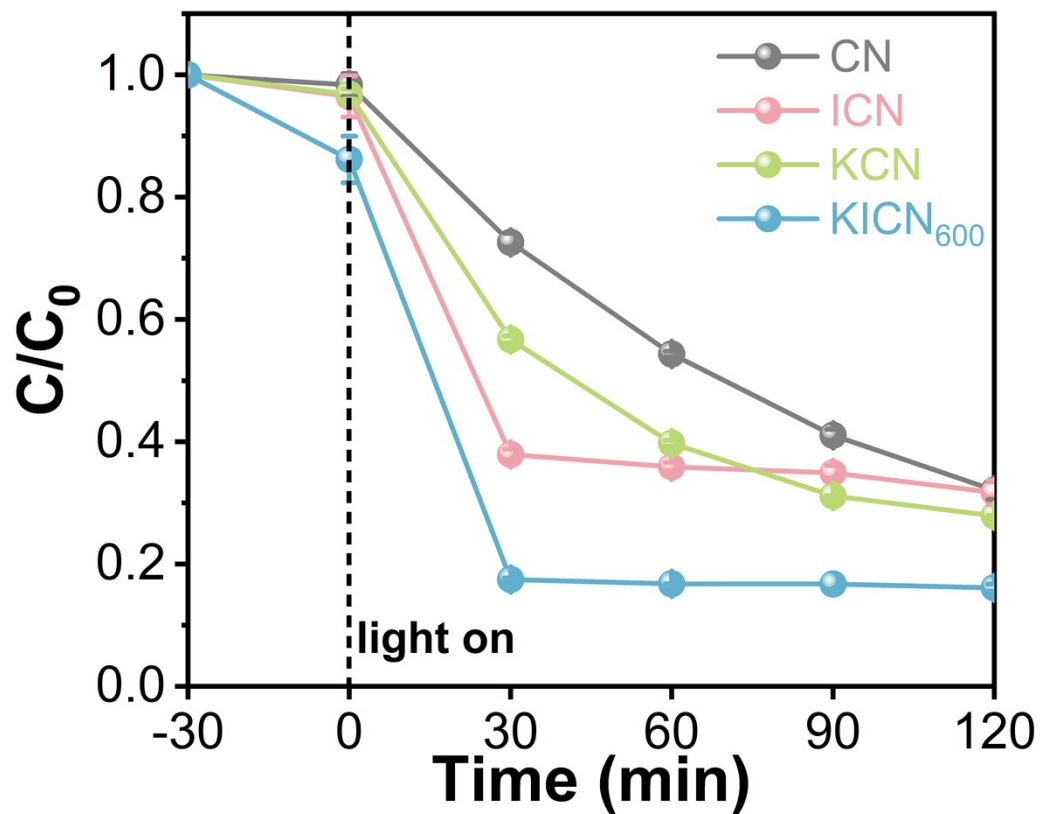


Fig. S9 photocatalytic tetracycline degradation performance of CN, ICN, KCN and KICN₆₀₀.

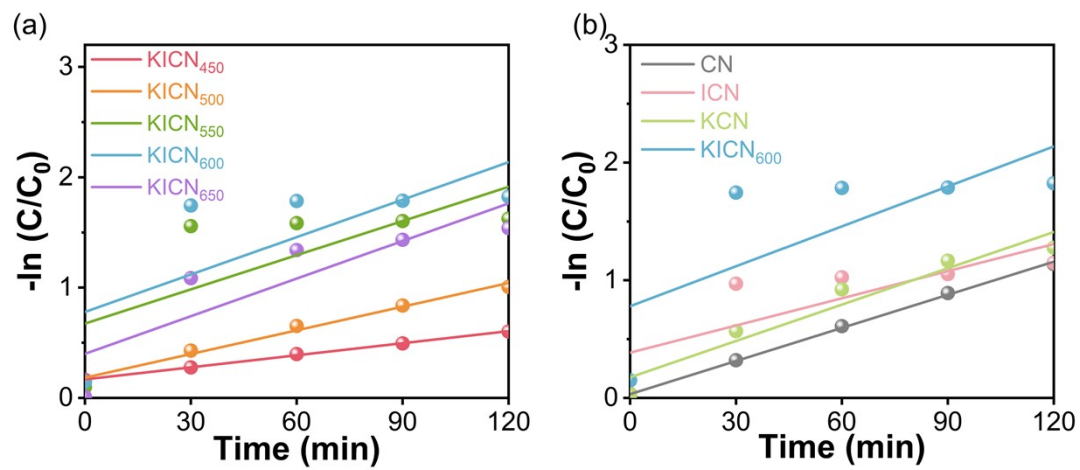


Fig. S10 The pseudo-first-order reaction kinetics of the photocatalytic degradation of TC by KICN_T (a) and CN, KCN, ICN, and KICN₆₀₀ (b)

Sample	S _{BET} (m ² g ⁻¹)	Pore size (nm)	Pore Volume (m ³ g ⁻¹)
KICN ₄₅₀	5.44	21.38	0.075
KICN ₅₀₀	4.04	25.78	0.070
KICN ₅₅₀	10.05	2.79	0.030
KICN ₆₀₀	10.19	7.92	0.066
KICN ₆₅₀	26.51	18.98	0.304
CN	22.05	9.9	0.186
KCN	11.26	15.66	0.134
ICN	10.10	12.49	0.095

Table S1 Summary of structural characteristics for all samples

Table S2 XPS elemental analysis results for CN, KICN₅₅₀, KICN₆₀₀, and KICN₆₅₀

Sample	C (at %)	N (at %)	K (at %)	I (at %)	C/N (molar ratio)
CN	60.98	39.02	-	-	1.56
KICN ₅₅₀	51.34	47.03	1.43	0.2	1.09
KICN ₆₀₀	48.84	45.96	5.01	0.19	1.06
KICN ₆₅₀	73.61	23	3.35	0.05	3.2

Table S3 Fractions of C 1s XPS spectra

Sample	XPS peak configuration		
	N-C=N (%)	C-NH _x /C≡C (%)	C-C//C=C (%)
CN	0.51	0.07	0.42
KICN ₅₅₀	0.64	0.06	0.31
KICN ₆₀₀	0.59	0.16	0.25
KICN ₆₅₀	0.11	0.34	0.55

Table S4 Fractions of N 1s XPS spectra

Sample	XPS peak configuration			
	π - π^* (%)	-NH _x (%)	N-(C) ₃ (%)	C-N=C (%)
CN	0.08	0.09	0.23	0.60
KICN ₅₅₀	0.08	0.09	0.19	0.63
KICN ₆₀₀	0.10	0.15	0.12	0.63
KICN ₆₅₀	0.04	0.28	0.28	0.40

Table S5 K and I element contents in KICN₅₅₀, KICN₆₀₀, and KICN₆₅₀ obtained from ICP-MS

Sample	K (wt %)	I (wt %)
KICN ₅₅₀	3.84	1.84
KICN ₆₀₀	15.47	0.60
KICN ₆₅₀	10.87	0.05

Table S6 Comparison of data for photocatalytic production of H₂O₂ over different catalysts

Photocatalyst	Light	Sacrificial agents	Gas	Evolution rates (μmol g ⁻¹ h ⁻¹)	Ref.
OCN	λ>420 nm	10 vol% IPA	O ₂	1200	1
DCN	λ>420 nm	20 vol% IPA	O ₂	96.8	2
Ti ₃ C ₂ /g-C ₃ N ₄	λ>420 nm	10 vol% IPA	O ₂	131.71	3
CN ₄	λ>420 nm	10 vol% IPA	O ₂	574	4
NDCN	λ>420 nm	10 vol% IPA	O ₂	476	5
K-CN-2	λ>420 nm	20 vol% IPA	O ₂	266	6
Ni ₄ %/O _{0.2} tCN	λ>420 nm	10 vol% EtOH	O ₂	2464	7
PCN	λ>420 nm	10 vol% IPA	O ₂	1071.7	8
CDs ₁₀ MCN	λ>420 nm	10 vol% IPA	O ₂	423	9
NDKCN	AM 1.5	10 vol% EtOH	O ₂	2340.3	10
S-CNT-Zn	λ>420 nm	20 vol% EtOH	O ₂	2708	11
KICN ₆₀₀	λ>400 nm	10 vol% IPA	Air	3067.5	This work

Table S7 K and I element contents in KICN₆₀₀ before and after recycling obtained from ICP-MS

Sample	K (wt %)	I (wt %)
KICN ₆₀₀ -before	15.47	0.60
KICN ₆₀₀ -after	13.10	0.51

Table S8 Comparison of photocatalytic degradation data for tetracycline over different catalysts

Photocatalyst	Light	TC concentration (mg L ⁻¹)	Time (min)	Efficiency (%)	Ref.
PbMoO ₄	Xe lamp, 35W, -	10	180	55	12
LaMnO ₃ /g-C ₃ N ₄	Xe lamp, 300 W, $\lambda > 420$ nm	20	120	61.4	13
SrTiO ₃ /Ag/Ag ₃ PO ₄	Xe lamp, 500 W, $\lambda > 420$ nm	10	15	72	14
B-TiO ₂	Xe lamp, 1000W, $\lambda > 400$ nm	10	240	66.2	15
PTI/g-C ₃ N ₄	Xe lamp, 500W -	10	150	68	16
BWO-O ₃	Xe lamp, 300 W, $\lambda > 420$ nm 12 W LED	20	180	79.68	17
BiOI/Bi ₂ O ₃	- 400 nm < λ < 780 nm metal halide lamp,	20	120	80.01	18
MgO NFs	400 W -	10	120	77.3	19
Cl-BiOBr	Xe lamp, 500W -	20	120	76.2	20
KICN ₆₀₀	Xe lamp, 300 W, $\lambda > 400$ nm	80	120	83.9	This work

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