Supporting Information

K-intercalated polymeric carbon nitride with nitrogen defects for efficient photocatalytic H_2O_2 production

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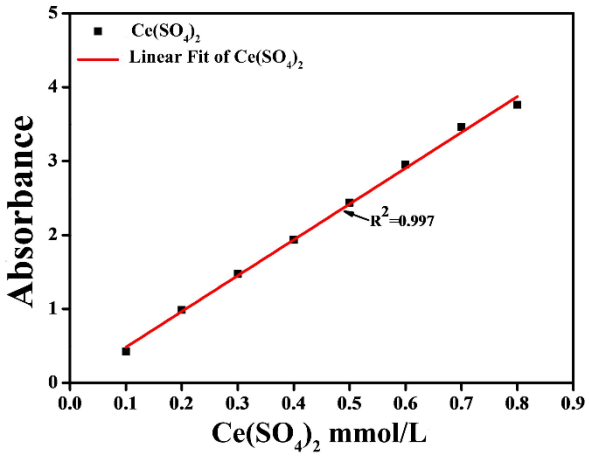

Fig. S1. $Ce(SO_4)_2$ standard curve for concentration

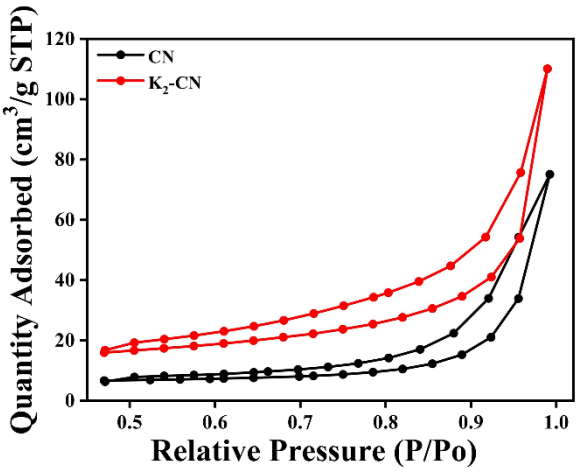

Fig. S2. N_2 adsorption-desorption isotherm curves of as-prepared sample

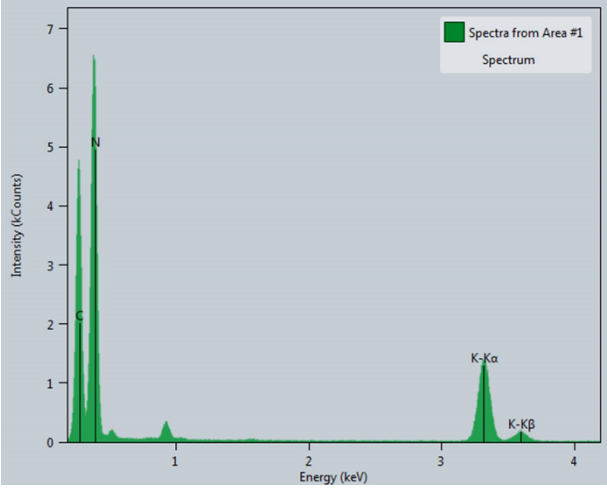

Fig.S3. EDS spectrum of K_2-CN

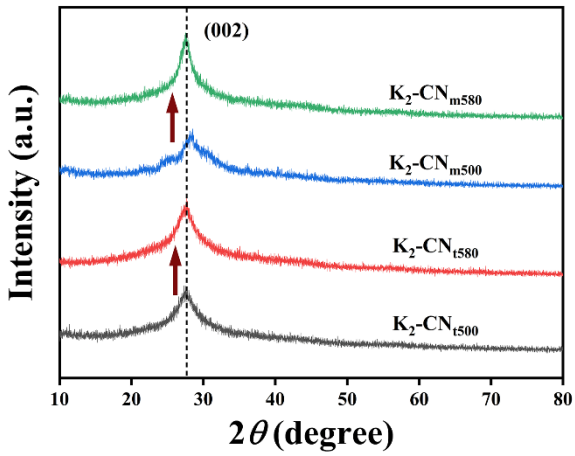

Fig. S4. XRD patterns of K_2-CN_{t580}, K_2-CN_{m580}, K_2-CN_{t500}

Table. S1. Elemental Composition and the N/C Atomic Ratios of the K_2-CN_{m500} and K_2-CN_{t500}

Catalyst	C (wt %)	N (wt %)	N/C (mol/mol)	Weight (mg)
K_2-CN_{m500}	26.92	45.05	1.67	2.00
K_2-CN_{t500}	26.01	43.08	1.65	2.00
K_2-CN_{m580}	25.21	41.05	1.63	2.00
K_2-CN_{t580}	26.62	43.13	1.62	2.00

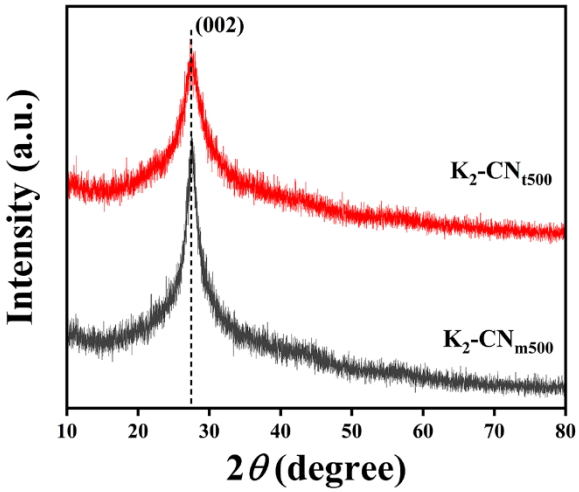

Fig. S5. XRD patterns of K_2-CN_{t500} and K_2-CN_{m500}

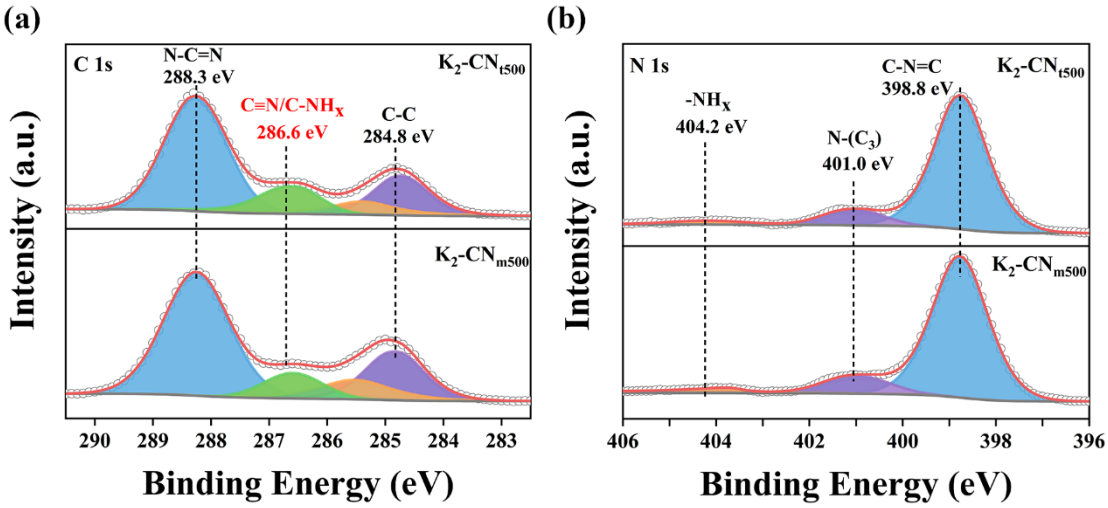

Fig. S6. (a) C 1s XPS spectra and (b) N 1s XPS spectra of K_2-CN_{t500} and K_2-CN_{m500} photocatalysts.

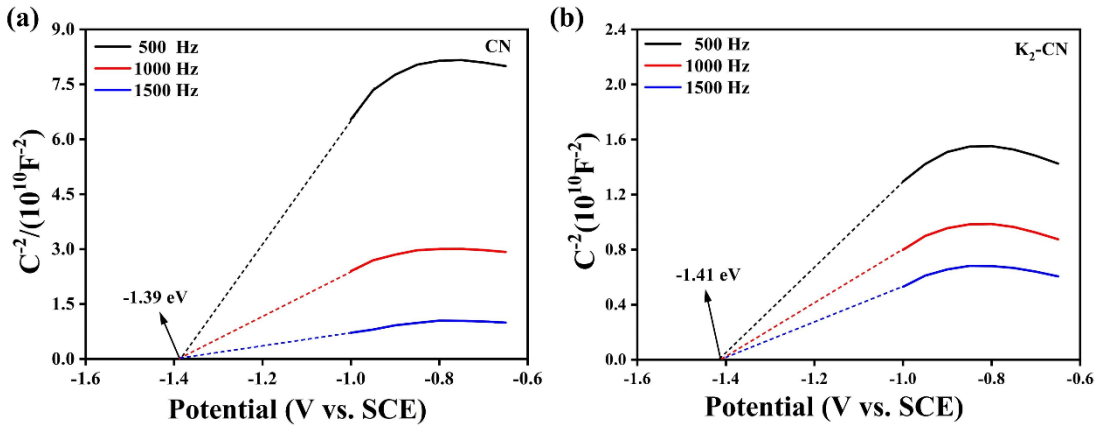

Fig. S7. Model-Schottky curves of plots (potential vs. SCE) of (a) CN and (b) K_2-CN at 500 Hz, 1000 Hz and 1500 Hz

The Calculation of Apparent Quantum Efficiency:

$$AQE = \frac{N_e}{N_p} = \frac{\text{number of consumed electrons}}{\text{number of incoming photons}} = \frac{10^9*(v*N_A*K)*(h*c)}{I*A*\lambda}*100\% \quad (1)$$

N_e: number of consumed electrons; N_p: number of incoming photons; ν: the reaction rate; N_A: Avogadro's number ($6.02*10^{23}$ mol^{-1}); K: number of electrons transferred by the reaction; *h*: Planck constant ($6.62*10^{-34}$ J·s); c: the speed of light ($3.0*10^8$ $m·s^{-1}$); I: optical functional density ($W·m^{-2}$); A: incident illumination area (m^2); λ: wavelength of incident light (λ=420nm). In this work, "I" is 9.02 $mV·cm^{-2}$, the calculated AQE is 15.37%.

The Koutecky-Levich Equation:

$$j^{-1} = j_k^{-1} + B^{-1}\Omega^{-1/2} \quad (2)$$

$$B = 0.2nFv^{-1/6}CD^{-2/3} \quad (3)$$

The j, j_k, Ω, n, F, ν, C and D respectively represent the current density; kinetic current density; rotational speed; Faraday's constant; the kinetic viscosity of water; the volumetric concentration of oxygen and the diffusion coefficient of oxygen.

Table. S2. Summary of the photocatalytic H_2O_2 production with modified g-C_3N_4 photocatalysts

Material	Sacrificial Reagent	Concentration of photocatalyst	pH	Irradiation conditions	H_2O_2 yields	AQE	Rate multiples of raw materials	Ref.
CoP/g-C_3N_4	ethanol	1 mg/mL	7	420 nm	140 μmol/L, 2h	----	1.35 times	[1]
OCN-NBS	isopropanol	1 mg/mL	3	325 nm	892 μmol/L, 1h	----	2.0 times	[2]
Au/C_3N_4-500	isopropanol	1 mg/mL	3	420 nm	330 μmol/L, 1h	----	2.3 times	[3]
OCN8	isopropanol	1.2 mg/mL	7	$\lambda \geq 420$ nm	1965 μmol/L, 1h	----	2.6 times	[4]
Au/$BiVO_4$-CN	isopropanol	1 mg/mL	3	385 nm	675.89 μmol/L, 1h	6.7 %	2.65 times	[5]
ac-g-c_3n_4	ethanol	0.67 mg/mL	7	420 nm	530 μmol/L, 1h	----	3.0 times	[6]
CN4	isopropanol	0.2 mg/mL	7	420 nm	287 μmol/L, 1h	27.8 %	3.3 times	[7]
g-C3N4/BDI	----	0.6 mg/mL	7	$\lambda > 420$ nm	9.6 μmol/L, 1h	----	4.0 times	[8]
NVCNS	isopropanol	0.2 mg/mL	7	420 nm	4413.1μmol/g, 1h	3.0 %	4.6 times	[9]
PI_X-NCN	----	1 mg/mL	7	420 nm	120 μmol/L, 2h	3.2 %	6.0 times	[10]
PCN-5/CS	$AgNO_3$	1 mg/mL	9	450 nm	826 μmol/g, 1h	18.1 %	6.55 times	[11]
P-CN	isopropanol	1 mg/mL	7	> 420 nm	1500 μmol/L, 3h	----	6.6 times	[12]
TC/CN	ethanol	1 mg/mL	7	420 nm	600 μmol/L, 1h	4.62 %	9.3 times	[13]
CN_{QDS}@MA-Ag	isopropanol	1 mg/mL	7	420 nm	39.82 μmol/L, 1h	----	10.0 times	[14]
PCNHS-17	isopropanol	0.5 mg/mL	7	$\lambda > 420$ nm	90 μmol/L, 1h	----	11.2 times	[15]
K_2-CN	isopropanol	1 mg/mL	7	$\lambda > 420$ nm	19663 μmol/L, 1h	15.37 %	14.0 times	**This work**

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