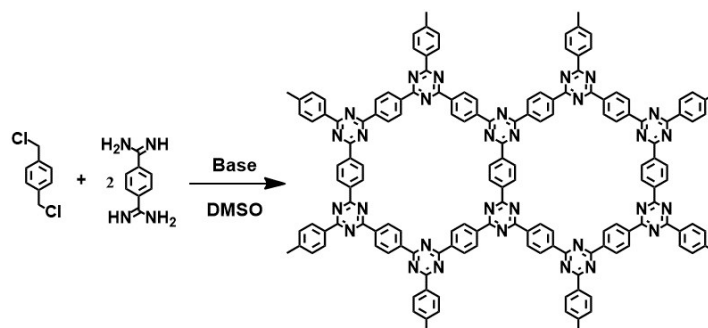


1. Materials

All the reagents without special descriptions were purchased from commercial suppliers. α , α' -dichloro-*p*-xylene, α , α' -dibromo-*p*-xylene, 4, 4'-bis(bromomethyl)-biphenyl, 1, 3, 5-tris(bromomethyl)benzene, terephthalic acid (TA) and dimethyl sulfoxide (DMSO) were purchased from Shanghai Aladdin Biochemical Technology Co, Ltd. Sodium bicarbonate (NaHCO_3), cesium carbonate (Cs_2CO_3), sodium carbonate anhydrous (Na_2CO_3), sodium hydroxide (NaOH), absolute ethanol and *N,N*-dimethylformamide (DMF) were analysis grade and purchased from National Medicines Corporation Ltd. of China.

2. Experimental section

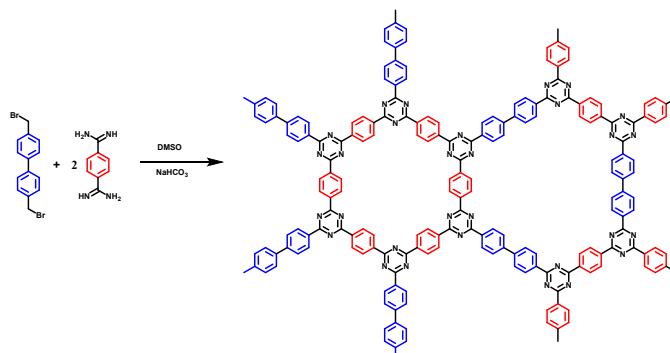
2.1 Synthesis of CTF-Cl-1



At first, we synthesized CTF-Cl-1 from a benzyl chloride monomer, which was used as model reaction to optimize the conditions. After screened the various bases (i.e. Cs_2CO_3 , Na_2CO_3 , NaHCO_3 and *t*-BuOK), NaHCO_3 was confirmed to be the most effective one (Table S1 and Figure S1 and S2). CTF-Cl-1 was synthesized by a simple polycondensation. α , α' -Dichloro-*p*-xylene (87.5 mg, 0.5 mmol), terephthalamidine dihydrochloride (235.2 mg, 1.0 mmol), and base (2.2 mmol) were added to a solution of DMSO (25.0 mL) in 50 mL round-bottom flask. The mixture was heated, with magnetic stirring, at 100 °C for 24 h, and then 160°C for 48 h. After cooling to room temperature, the solid was obtained by filtration, and then the filter cake was washed

with DMF, absolute ethanol, dilute hydrochloric acid and water for several times, and then freeze-dried to obtain a yellow powder sample (175mg, Yield: 90%).

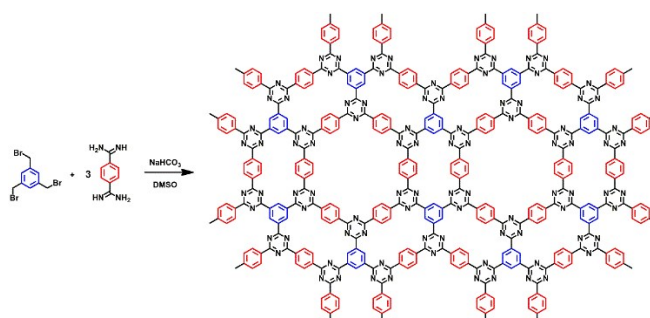
2.2 Synthesis of CTF-Br-1 and CTF-Br-2



α , α' -dibromo-p-xylene(132 mg, 0.5 mmol)/4,4'-bis(bromomethyl)biphenyl (170 mg, 0.5 mmol), terephthalamidine dihydrochloride (235.2 mg, 1.0 mmol), and NaHCO_3 (4.4 mmol) were added to a solution of DMSO (25.0 mL) in 50 mL round-bottom flask. The mixture was heated at 100 °C for 24 h, and then 160°C for 48 h. After cooling to room temperature, the solid was obtained by filtration, and then the filter cake was washed with DMF, absolute ethanol, dilute hydrochloric acid and water for several times, and then freeze-dried to obtain a yellow powder sample.

Yield: 98%(CTF-Br-1 190 mg); 95%(CTF-Br-2 220mg).

2.3 Synthesis of CTF-Br-3



1,3,5-tris(bromomethyl)benzene (178.5 mg, 0.5 mmol), terephthalamidine dihydrochloride (353 mg, 1.5 mmol), and NaHCO_3 (6.6 mmol) were added to a solution of DMSO (25.0 mL) in 50 mL round-bottom flask. The mixture was heated at 100 °C for 24 h, and then 160 °C for 48 h. After cooling to room temperature, the solid was

obtained by filtration, and then the filter cake was washed with DMF, absolute ethanol, dilute hydrochloric acid and water for several times, and then freeze-dried to obtain yellow powder sample., 318 mg, yield: 90%.

2.4 Synthesis of CTF-HUST-1

The CTF-HUST-1 was prepared according to the reported procedure.¹

2.5 General procedure for photocatalytic activity measurement

The photocatalysis measurements were conducted using 20 mg photocatalyst, 100 ml H₂O and 1.81 g glucose (0.1 M), and the mixture was dispersed by ultrasonication for 10 minutes to obtain a uniform dispersion. Then, 3 wt% Pt (160 μl 0.0161 M H₂PtCl₆ aqueous solution) was added into the solution system. The pH value was adjusted using NaOH solutions. The samples were added into a 500 ml quartz transparent photoreactor (Aulight, China). The above suspension was bubbled with high-purity nitrogen gas (99.999%) for 30 minutes, and were kept at 25°C using circulating water. The pressure of the photocatalytic experiment was at 1 bar. The current of the photoreactor was controlled at a certain power with an intensity of 0.21 W/cm², then the Xenon lamp (PLS-SXE300/300UV, perfect light, China) was turned on to start the photocatalysis measurements. Light intensities were tested by the optical power meter (PLS-MW2000, perfect light, China). Gas products were analyzed by using gas chromatography (GC-2014, Shimadzu, Japan) which is equipped with FID-2014 (the hydrogen flame ionization detector) and TCD-2014 (thermal conductivity detector) detectors.

2.6 Procedure for photocatalytic mechanism

The measurement was conducted by following the established procedure.² The mixture of 20 mg 3.0 wt.% Pt/CTF-Br-2 and 100 mL 0.50 mmol L⁻¹ aqueous TA solution was added into a 500 ml quartz transparent photoreactor. The other conditions are the same as the above photocatalysis measurement. The photocatalyst is removed by centrifugation after 1.5 h. The photoluminescence intensity of the clear solution was measured by a fluorescence spectrophotometer.

2.7 Typical procedure for photoelectrochemical test

The photocurrent tests were carried out on a electrochemical workstation (Chenhua, CHI760E) in a conventional three electrode configuration with Ag/AgCl (saturated KCl) as the reference electrode and Pt wire as the counter electrode. A 0.1 mol/L Na_2SO_4 aqueous solution was used as the electrolyte. The transient photocurrent was conducted under visible light irradiation with the fixed time interval.. The working electrodes were prepared as follows: 2 mg of the as-prepared photocatalyst was suspended in ethanol (5 mL) containing 1 wt% Nafion, and then were sonicated 10 min to produce a slurry, which was then dropped 100 μL onto an indium tin oxide (ITO) glass electrode with the area 1 cm^2 and the film was vacuum dried overnight. Mott–Schottky plots were determined with the same three electrode configuration in 0.1 mol/L Na_2SO_4 aqueous solution.

3. Supporting figures

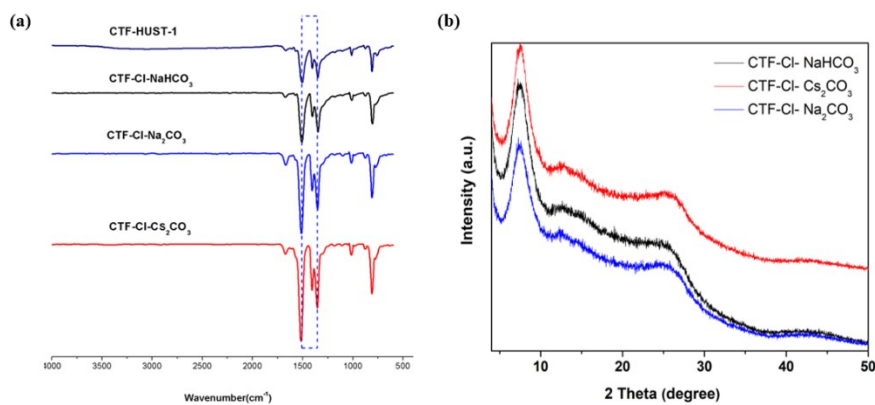


Figure S1. (a) FT-IR spectra and (b) PXRD pattern of CTF-Cl-1 synthesized from different bases.

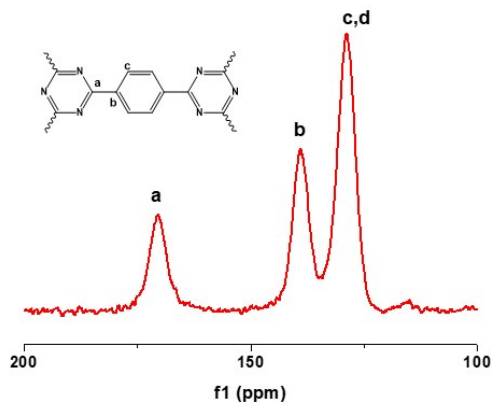


Figure S2. ^{13}C CP-MAS solid state NMR spectra of CTF-Cl-1(NaHCO_3).

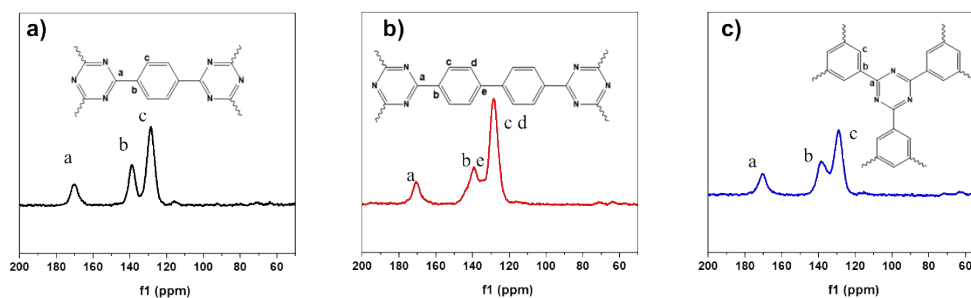


Figure S3. Assignments of the corresponding carbons in the solid-state ^{13}C CP-MAS NMR spectra of CTF-Br-1 (black), CTF-Br-2 (red), and CTF-Br-3 (blue).

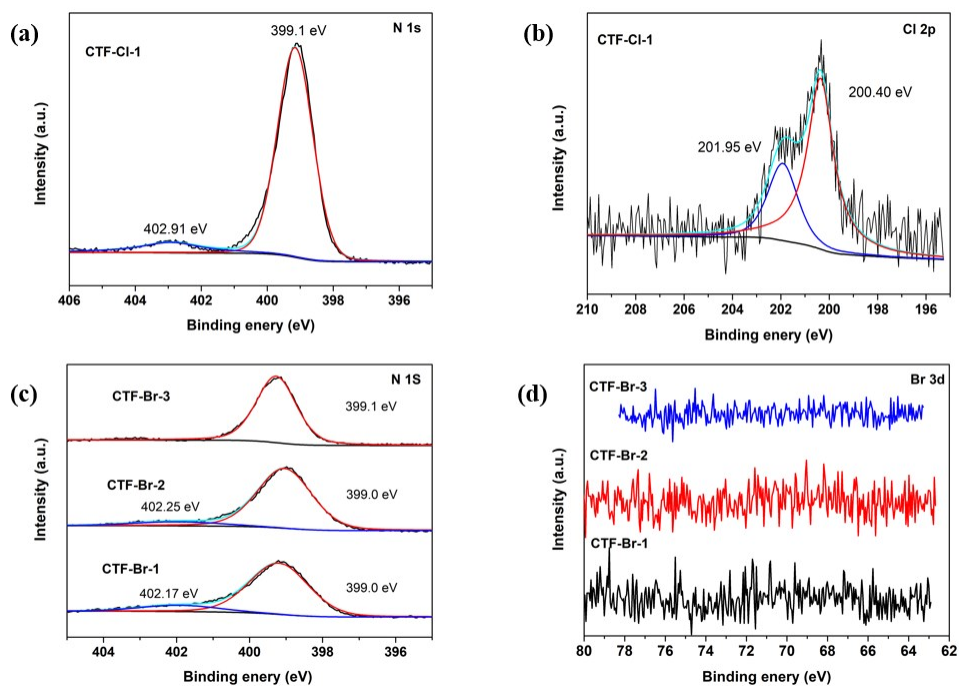


Figure S4. (a) N 1s XPS spectra of CTF-Cl-1; (b) Cl 2p XPS spectra of CTF-Cl-1; (c) N 1s XPS spectra of CTF-Br materials; (d) Br 3d XPS spectra of CTF-Br materials.

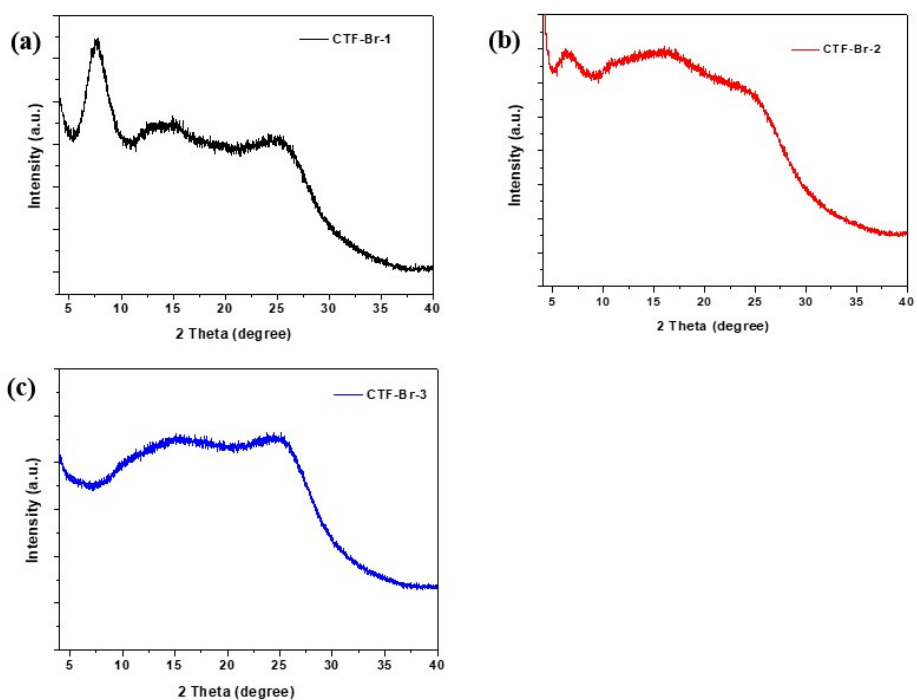


Figure S5. PXRD patterns of (a) CTF-Br-1, (b) CTF-Br-2 and (c) CTF-Br-3.

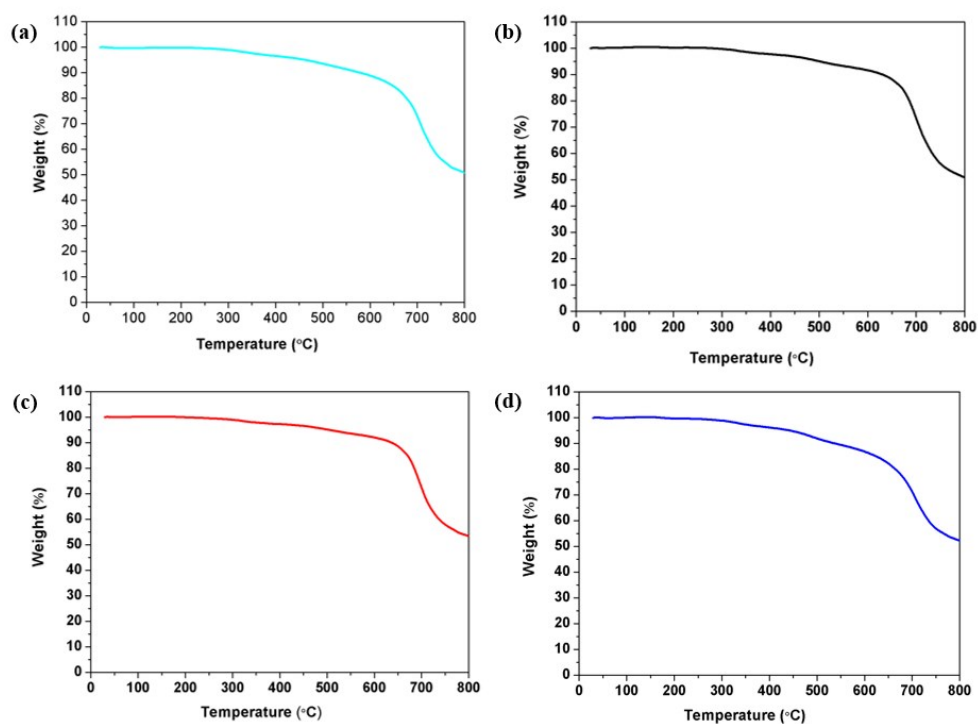


Figure S6. TGA curves of (a) CTF-Cl-1, (b) CTF-Br-1, (c) CTF-Br-2, and (d) CTF-Br-3 measured under nitrogen atmosphere.

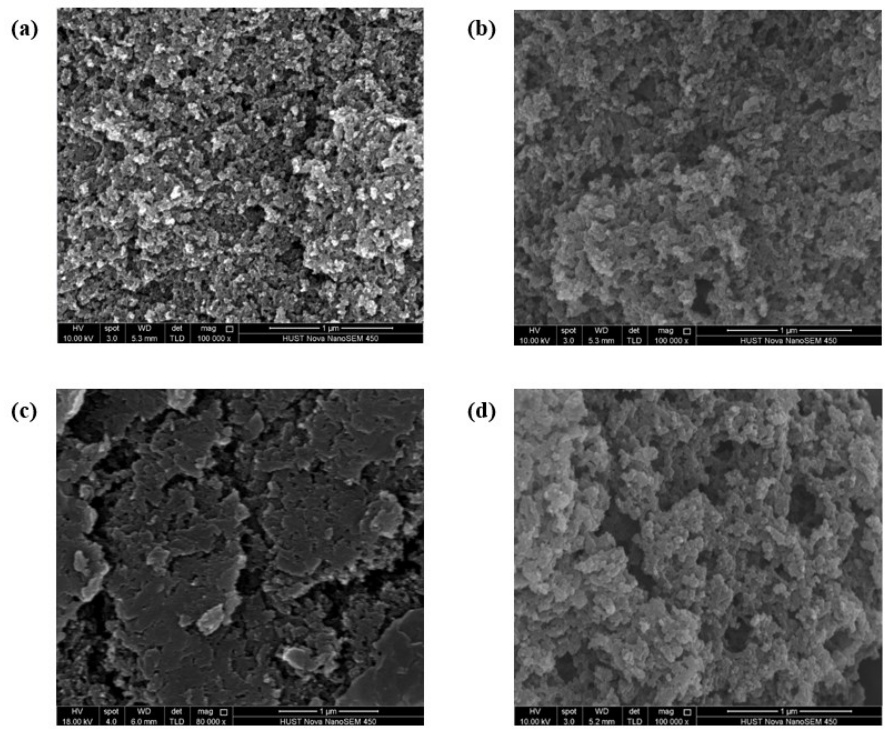


Figure S7. FE-SEM images of (a) CTF-Cl-1, (b) CTF-Br-1, (c) CTF-Br-2, and (d) CTF-Br-3.

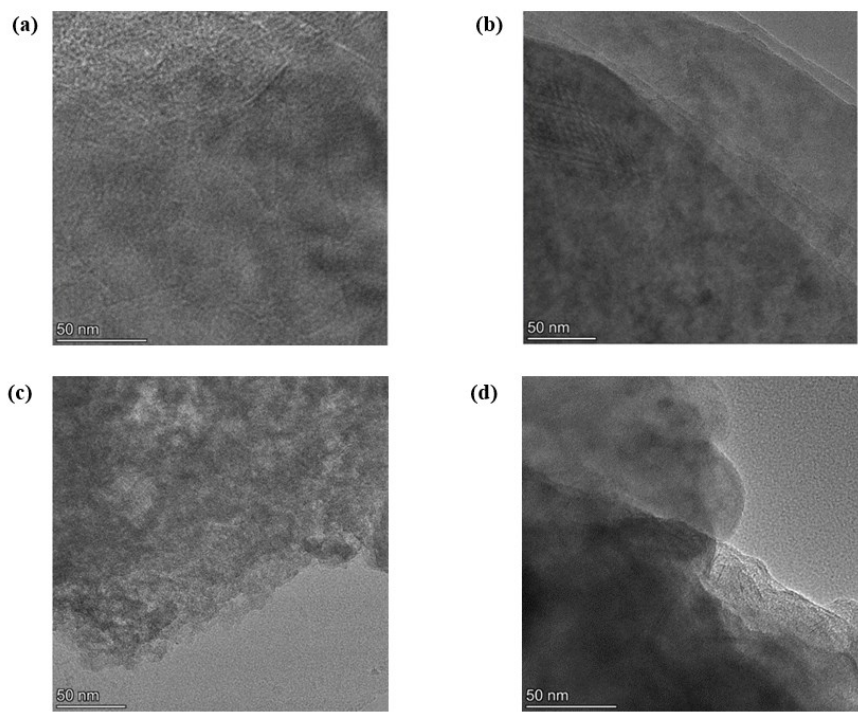


Figure S8. HR-TEM images of (a) CTF-Cl-1, (b) CTF-Br-1, (c) CTF-Br-2 and (d) CTF-Br-3.

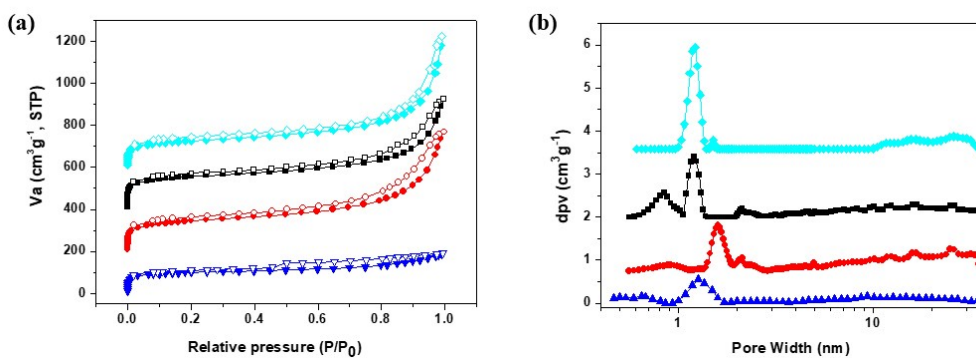


Figure S9. a) N_2 adsorption (closed circles) and desorption (open circles) isotherms (77 K) curves and b) corresponding pore size distributions of CTF-Br-1 (black curve), CTF-Br-2 (red curve), CTF-Br-3 (blue curve) and CTF-Cl-1 (cyan curve).

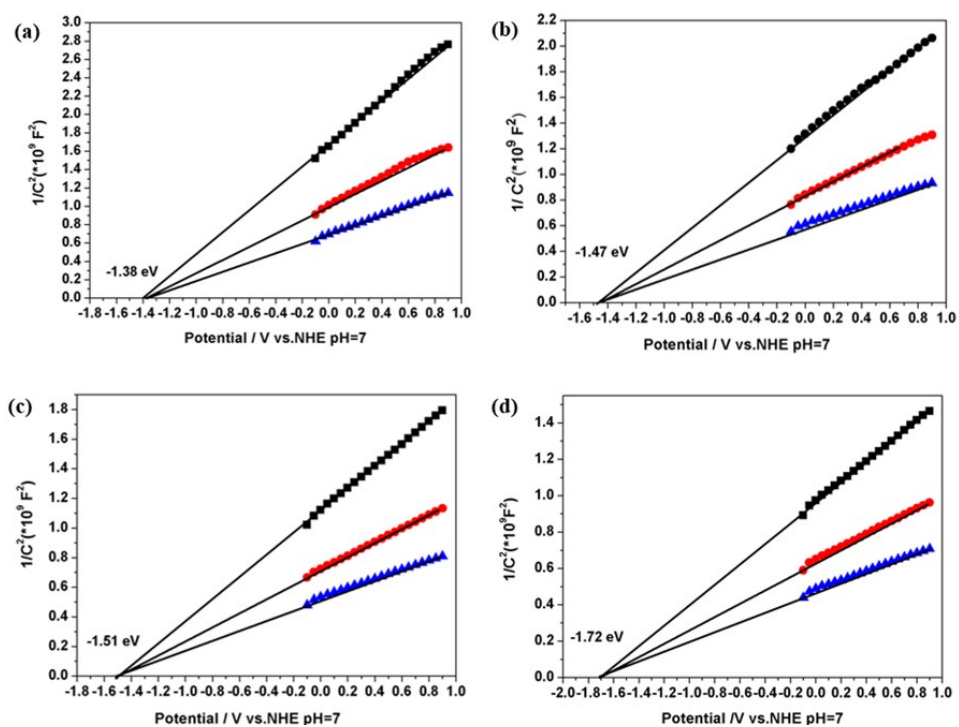


Figure S10. Mott-Schottky plots of (a) CTF-Cl-1, (b) CTF-Br-1, (c) CTF-Br-2, (d) CTF-Br-3, which were used to estimate the CBM band of the CTFs.

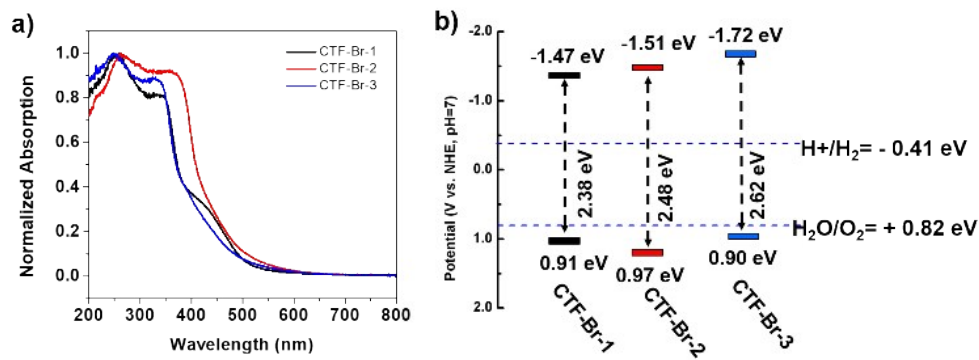


Figure S11. a) UV-Vis absorption spectra of CTF-Cl-1 (cyan curve), CTF-Br-1 (black curve), CTF-Br-2 (red curve) and CTF-Br-3 (blue curve) and b) the energy levels of CTF-Br-1, CTF-Br-2, and CTF-Br-3.

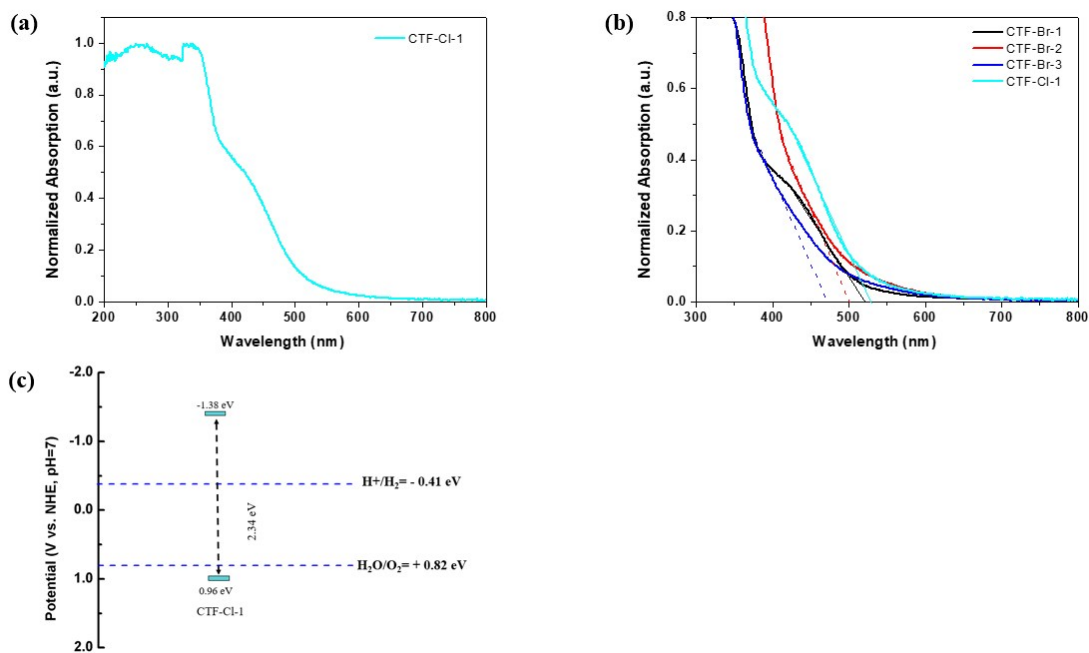


Figure S12. (a) UV-Vis spectra of CTF-Cl-1(cyan curve); (b) The band gap of CTF-Cl-1(cyan curve), CTF-Br-1(black curve), CTF-Br-2(red curve) and CTF-Br-3(blue curve); and (c) The energy levels of CTF-Cl-1.

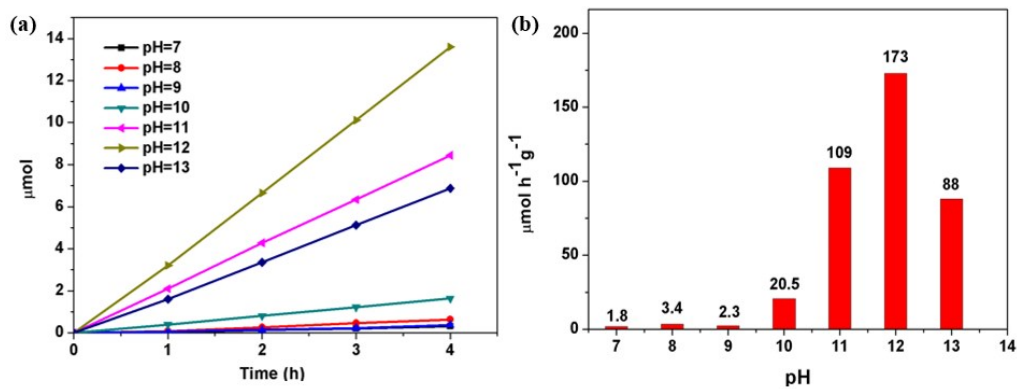


Figure S13. (a) The time course of H₂ production of CTF-Cl-1 from glucose aqueous solutions at different pH values. (b) H₂ evolution rate of CTF-Cl-1 from glucose aqueous solutions at different pH values.

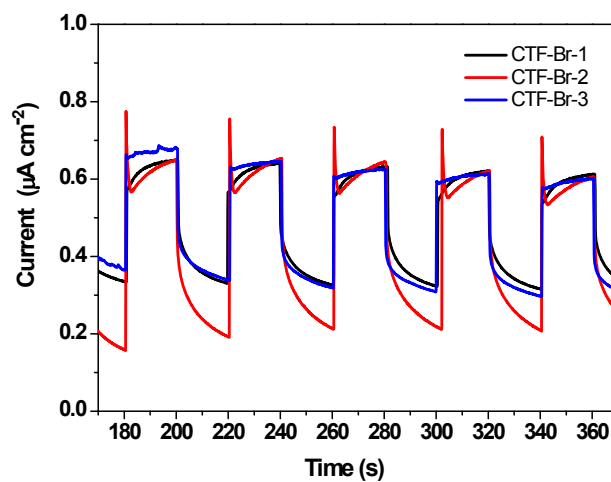


Figure S14. Photocurrent responses of CTF-Br-1, CTF-Br-2 and CTF-Br-3.

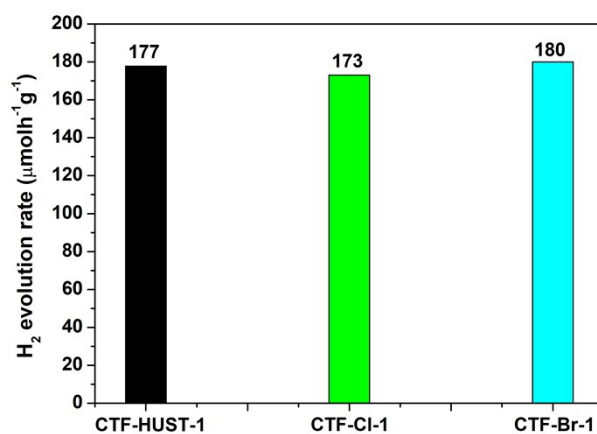


Figure S15. H₂ evolution rate of CTF-HUST-1, CTF-Cl-1 and CTF-Br-1 from glucose aqueous solutions.

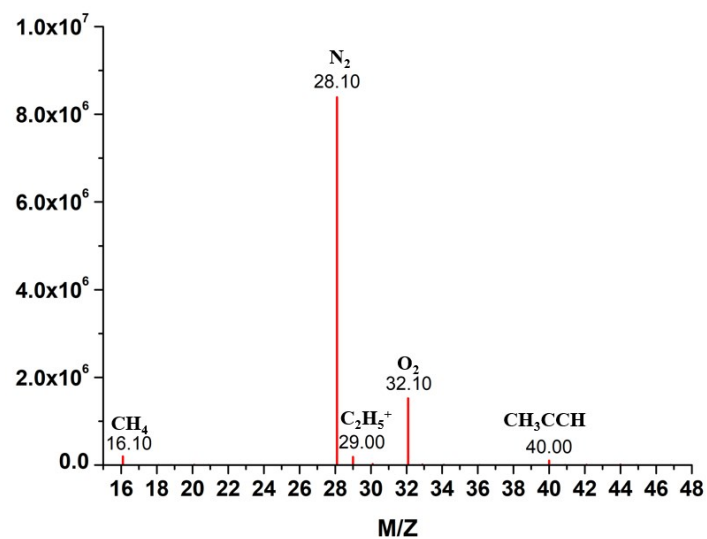


Figure S16. GC-MS data of gaseous phase from photoreforming of glucose.

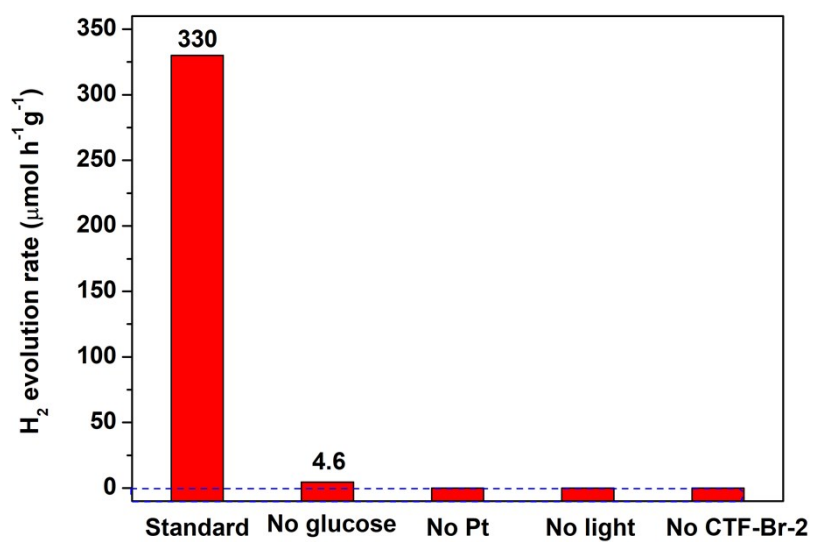


Figure S17. Control experiments conducted in the absence of glucose, Pt, light, or CTF-Br-2.

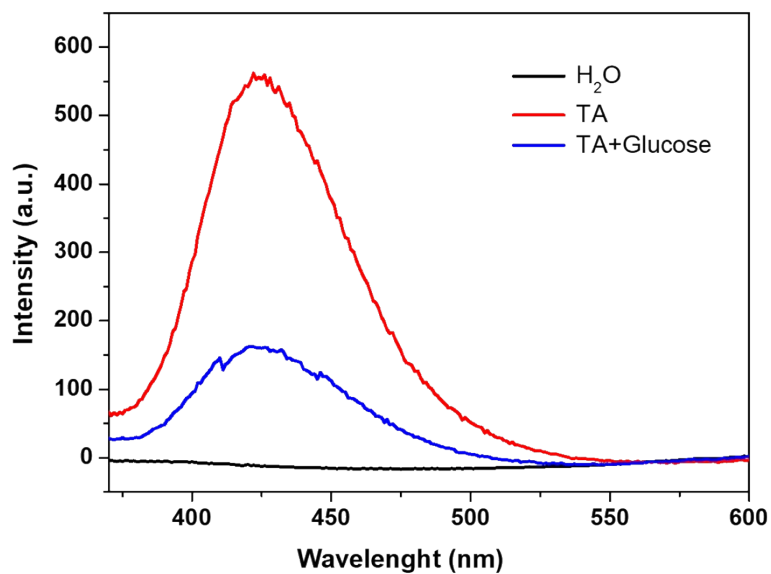


Figure S18. •OH-trapping photoluminescence spectra of Pt/CTF-Br-2 in various solutions.

Table S1. CTF-Cl-1 synthesized in different base reagents

Base	Yield (%)
<i>t</i> -BuOK	0
Cs ₂ CO ₃	75
NaOH	30
Na ₂ CO ₃	78
NaHCO ₃	90

Table S2. Elemental contents of CTFs measured by EA and XPS

Sample	Methods	N [%]	C [%]	H [%]	O [%]	Cl [%]	Br [%]
CTF-Cl-1	Theoretical (wt%)	22.11	75.79	2.1	0.0	0.0	0.0
	EA (wt%)	17.64	70.04	4.442	5.946	-----	-----
	XPS (wt%)	17.2	79.4	-----	3.0	0.4	-----
CTF-Br-1	Theoretical (wt%)	22.11	75.79	2.1	0.0	0.0	0.0
	EA (wt%)	17.83	70.05	4.464	2.542	-----	-----
	XPS (wt%)	19.94	75.58	-----	4.46	-----	0.02
CTF-Br-2	Theoretical (wt%)	18.42	78.95	2.63	0.0	0.0	0.0
	EA (wt%)	15.75	70.09	4.060	2.253	-----	-----
	XPS (wt%)	19.94	75.45	-----	4.60	-----	0.01
CTF-Br-3	Theoretical (wt%)	23.07	72.53	4.40			
	EA (wt%)	18.17	66.28	4.264	4.721	-----	-----
	XPS (wt%)	14.52	77.34	-----	8.13	-----	0.02

Notes: The elemental analysis (EA) as summarized in Table S2 shows the corresponding elemental contents appeared with reasonable amount. As compared to the calculated values, the carbon and nitrogen contents are smaller than those calculated from an ideal crystalline structures, whereas the hydrogen contents are larger or close to the calculated ones.

4. References

1. K. Wang, L. M. Yang, X. Wang, L. Guo, G. Cheng, C. Zhang, S. Jin, B. Tan and A. Cooper, *Angew. Chem., Int. Ed.*, 2017, **56**, 14149-14153.
2. M. Zhou, Y. Li, S. Peng, G. Lu and S. Li, *Catal. Commun.*, 2012, **18**, 21-25.