

Electronic Supplementary Materials

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Enhanced photocatalytic performance of S-doped covalent triazine framework for organic pollutant degradation

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S1 Synthesis of original CTF-1 and S-doped CTF-1

1,4-dicyanobenzene B (DCB) and trifluoromethanesulfonic acid (CF₃SO₃H) were purchased from J&K, Shanghai, China. Sublimation sulfur was obtained from Shanghai Aladdin Biochemical Technology Co., Ltd. Synthesis of the original CTF-1. 1,4-Dicyanobenzene (4 mmol) was dissolved in CF₃SO₃H (2.5 mL) with stirring in an ice-water bath at 0 °C. The resulting viscous yellow solution was stirred for 1.5 h and then heated in an oven at 100 °C for 20 min. The obtained yellow solid sample was washed three times with water and ethanol, dried in an oven at 60 °C overnight, and then the obtained white sample was ground into powder through an agate mortar.

Annealing treatment to synthesize CTFSx. Original CTF-1 (0.4 g) and sublimed sulfur of m_l (m_l = 0.004 g, 0.008 g, 0.02 g) were ground and mixed in an agate mortar for 30 min. The mixture was then pressed uniformly in a tube furnace, and then reacted at 250 °C for 1 h, the heating rate was 5 °C/min, and the flow rate of Ar gas (purity >99.999%) was 0.1 L/min. After cooling to room temperature, the block samples were thoroughly ground by agate grinding. Then, the powder was dispersed in alcohol (100 mL) and refluxed at 170 °C for 32 h. After this purification step, the

filtered powder was washed sequentially with alcohol, vacuum dried at 60 °C, and denoted as CTFS_x (x = 1, 2, 5).

S2 Characterization of the CTFs

Scanning electron microscopy (SEM) was performed on a Nano nova 450 SEM (FEI, The Netherlands). Transmission electron microscopy (HRTEM) was performed by Tecnai G2F30 S-Twin TEM (FEI, The Netherlands). Brunauer-Emmett-Teller (BET) surface area estimation using Nitrogen adsorption-desorption was performed at -196 °C on a NOVA-2000E surface area analyzer. Fourier Transform Infrared (FT-IR) spectra was recorded in the 4000-500 cm⁻¹ wavenumber region with a resolution of 4 cm⁻¹ using a Nicolet Thermo NEXUS 670 spectrometer. All UV-vis DRS studies of CTFs were performed on Shimadzu UV-2550. Using BaSO₄ as a UV-Vis spectrophotometer in the wavelength range 200-800 nm baseline correction reference.

S3 Photoelectrochemical measurements

Photocurrent responses, electrochemical impedance spectroscopy (EIS), and Mott-Schottky plots were recorded using a three-electrode quartz cell on a CHI 660E electrochemical workstation (CH Instrument, USA). For the photocurrent response, the samples were dispersed in ITO glass as the working electrode, and Pt flakes and Ag/AgCl/saturated KCl were used as the counter electrode and the reference electrode, respectively. The electrolyte is 0.1 M Na₂SO₄ solution, and the light source is a 300W xenon high-brightness cold light source (XD-300) with a cut-off filter ($\lambda > 420$ nm). Electrochemical impedance spectroscopy (EIS) was recorded using an alternating current (ac) voltage amplitude of 5 mV over a frequency range of 10⁶ at 10 Hz in the dark. Mott-Schottky plots were performed in 0.1 mol/L Na₂SO₄ (pH = 6.8) at 1000 Hz. The samples were dispersed on ITO glass and used as working electrode. Voltage sweep from open circuit (0.2 V) to 1.0 V.

Table S1 The structure of CTF-1 and CTFSx

Samples	BET surface area/m ² ·g ⁻¹	Pore volume/cm ³ ·g ⁻¹	Pore size/nm
CTF-1	23.43	0.12	5.63
CTFS ₁	35.67	0.23	6.78
CTFS ₂	37.88	0.17	7.20
CTFS ₅	42.51	0.16	8.55

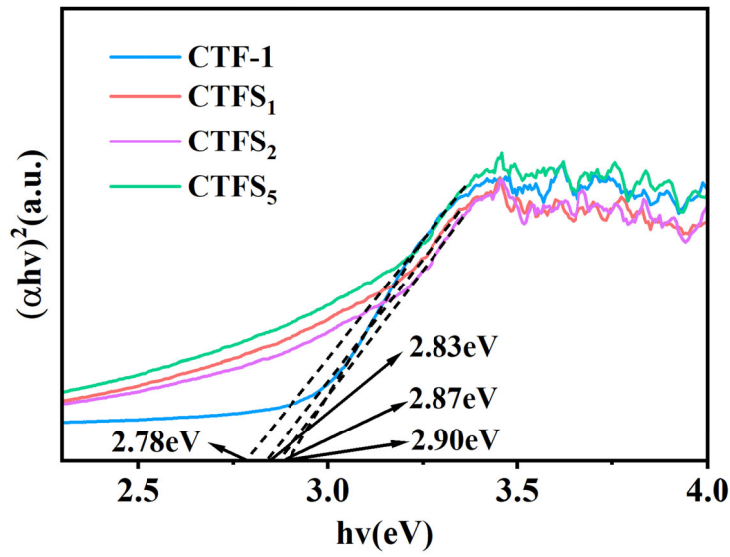


Fig. S1 Band gap diagrams of CTF-1 and CTFSx

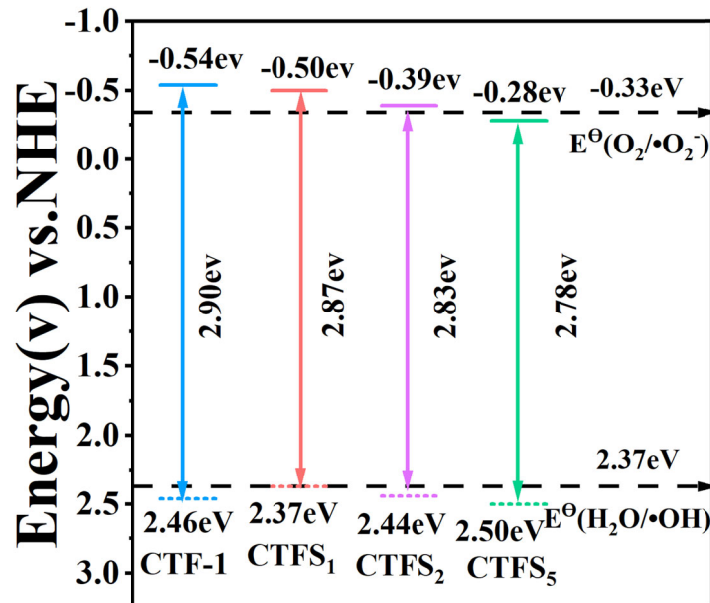


Fig. S2 Schematic diagram of the ribbon structure of CTFs

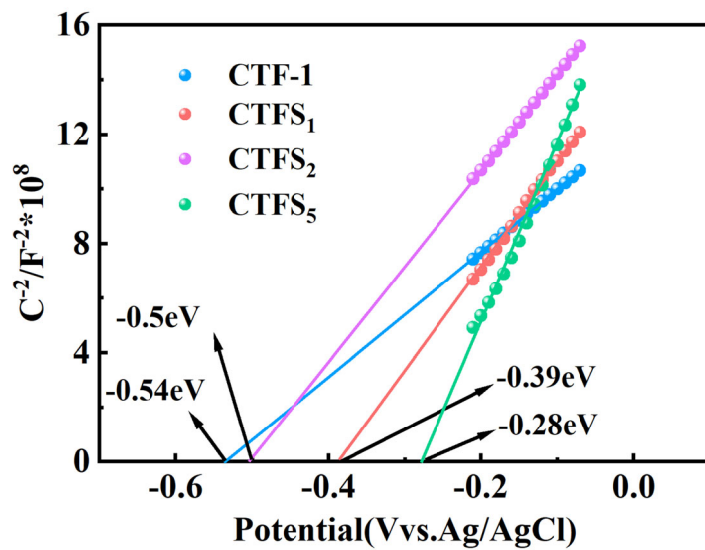


Fig. S3 Mott-Schottky plots of CTF-1 and CTFSx

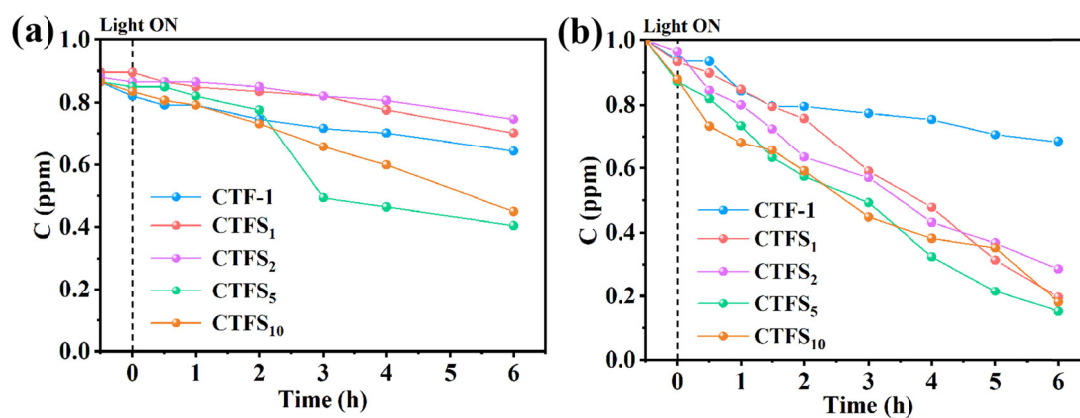


Fig. S4 Removal efficiency of MO (a) and BPA (b) by CTFs before and after