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Fabrication of novel carbon species into porous g-C_3N_4 nanosheets framework with enhanced photocatalytic performance

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Experimental

Characterization

The transmission electron microscopy (TEM) experiment was performed using JEM-1400. X-ray diffraction (XRD) patterns were measured by RigakuD/max-2000 using Cu Kα radiation. X-ray photoelectron spectroscopy (XPS) analysis was obtained using a HI5700ESCA system with X-ray photoelectron spectroscope, which has an Al K (1486.6 eV) monochromatic X-ray radiation. The UV-vis diffuse reflectance spectra (DRS) were measured using UV-vis spectrophotometer (Hitachi UV-3010) at room temperature.

Photoelectrochemical characterization

Photoelectrochemical measurements were conducted in a conventional three-electrode cell system on CHI760E electrochemical workstation. In this electrochemical system, a Pt pole, Ag/AgCl electrode, and the as-prepared sample electrode coated at FTO glass were used as the counter electrode (CE), reference electrode (RE), and the working electrode (WE). Na_2SO_4 aqueous solution (0.5 M, 50 mL) was used as the electrolyte. A 300W Xe lamp with cutoff filter (> 420 nm) was selected as the light source. The working electrodes were prepared in atypical method: 10 mg photocatalyst was dispersed in a mixed solution of Nafion and ethanol to obtain a slurry. Then the resulting slurry was dropped on FTO glass electrode and dried at 80 °C.

Photocatalytic degradation reaction

The photocatalytic performances of the as-prepared catalyst are explored by the degradation of Rhodamine B (RhB) and tetracycline hydrochloride (TC-HCl).

Typically, 100 mg catalyst was suspended in 100 mL RhB (10 mg/L) liquid solution by ultrasound generator for 5 min. Then, the mixed solution was transferred into a Pyrex photocatalytic reactor with a circulating water to maintain a constant temperature 25 ◦C. Before irradiation, the suspension was stirred in the dark for 30 min to achieve the absorption–desorption equilibrium (Fig.S5 and Fig.S6). The solution was irradiated by a 300 W Xenon lamp with an optical filter (> 420 nm). In order to supervise the photocatalytic reaction, 3 mL of RhB solution was sampled at the certain time intervals and centrifuged to remove the catalyst power. The solution was analyzed by UV-vis spectrophotometer at the absorption band maximum (554 nm). The TC-HCl degradation process is similar with RhB, except the monitoring wavelength is 357 nm. The equation of the degradation rate was as follows：

$$Degradation\ rates = \frac{C_0 - C_t}{C_0} \times 100\%$$

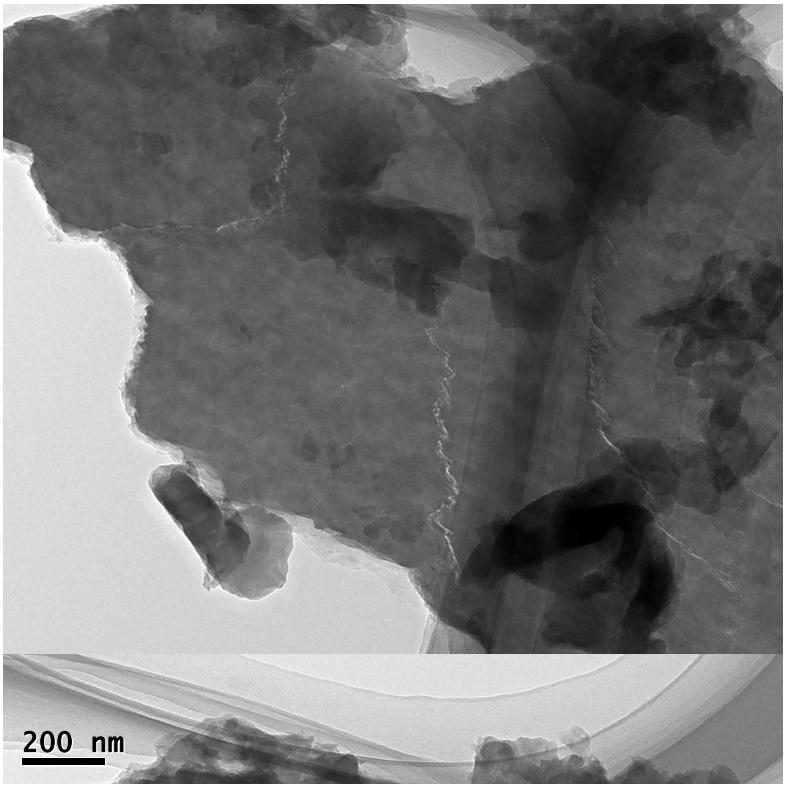

Fig.S1 TEM image of CN

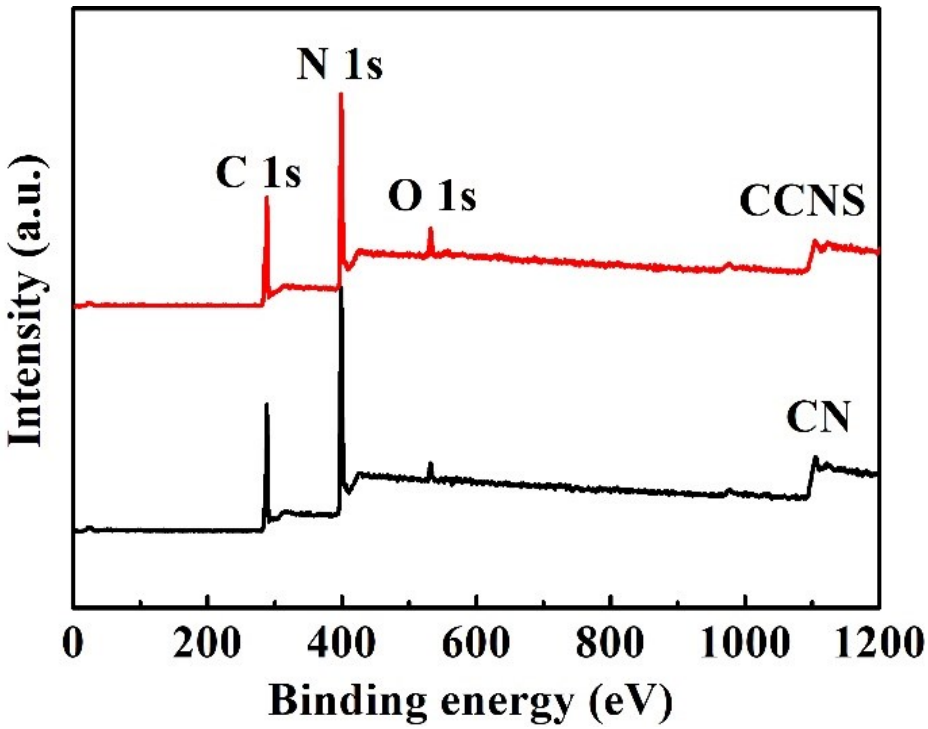

Fig.S2 XPS survey spectra over CN and CCNS

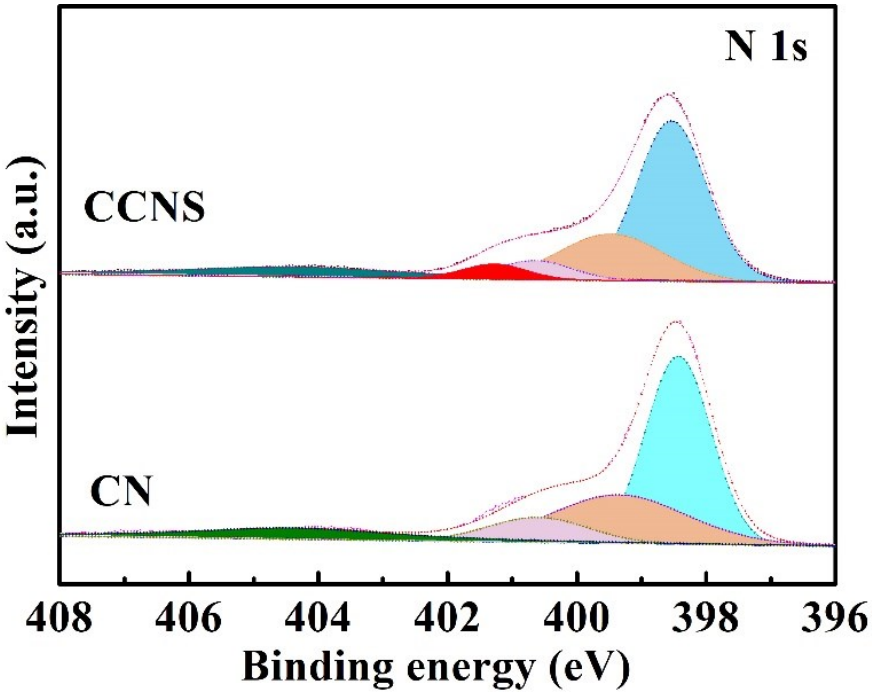

Fig.S3 XPS spectra of N 1 s over CN and CCNS

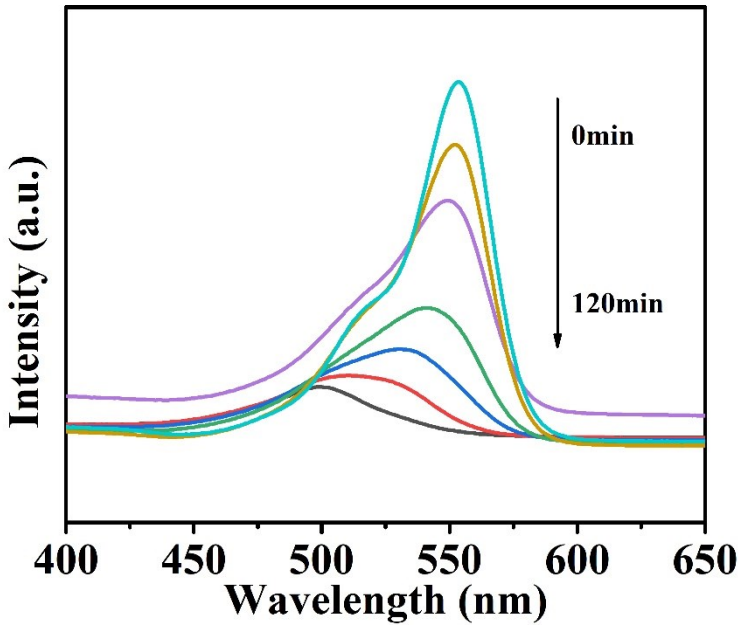

Fig.S4 the UV-vis spectra of degradation of RhB over CCNS

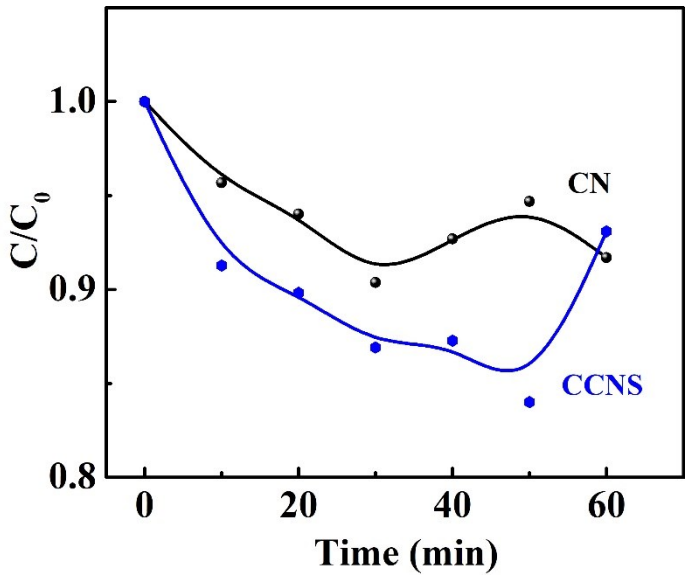

Fig.S5 adsorption curves of TC-HCl over different photocatalysts

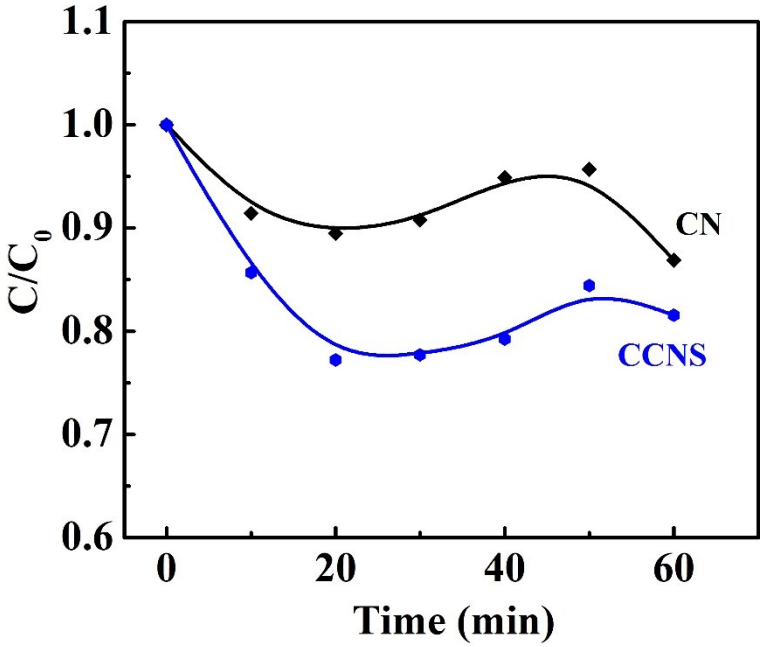

Fig.S6 adsorption curves of RhB over different photocatalysts