

Electronic Supplementary Information

Hierarchically porous graphitic carbon nitride: large-scale facile synthesis and its application toward photocatalytic dye degradation

Shuang Gu,^{a,b,c} Jiale Xie,^b and Chang Ming Li^{a,b,c*}

^a Faculty of Materials and Energy, Southwest University, Chongqing 400715, P.R. China

^b Institute for Clean Energy & Advanced Materials, Southwest University, Chongqing 400715, P.R. China

^c Chongqing Key Laboratory for Advanced Materials and Technologies of Clean Energies, Chongqing 400715, P.R. China

*Corresponding author. Tel/Fax: +86 023 68254727; E-mail: ecmli@swu.edu.cn (C. M. Li).

Experimental section

Materials

Melamine (MA), ammonium persulfate (APS), methyl orange (MO) and commercial Degussa P25 were purchased from Aladdin Industrial. All the chemical reagents used as received without further purification.

Preparation of hp-g-CN

In a typical process, 1 g MA was dissolved in 50 ml deionized water with a water bath of 90 °C. Then 10 ml 0.3 M APS was added in the above solution slowly. After stirred for 1 h, the yellow precursor was collected by centrifuge when the solution cooled down to room temperature. The amount of APS can be optimized to just suit for the reaction for small remnant, which could be further completely consumed by adding sodium carbonate. Finally, the yellow precursor was placed into a crucible with a cover followed by heating to 550 °C for 2 h with a heating rate of 2 °C min⁻¹ under Ar.

Characterizations

Powder X-ray diffraction (XRD) data were recorded on a RigakuD/MAX 2550 diffractometer. Fourier transform infrared (FT-IR) spectrum was performed on an IFS 66 V/S (Bruker) IR spectrometer in the range of 400–4000 cm⁻¹. X-ray photoelectron spectroscopy (XPS) analysis was measured on an ESCALAB MK II X-ray photoelectron spectrometer using Mg as the exciting source. Scanning electron microscopy (SEM) measurements were made on a XL30 ESEM FEG microscope. Transmission electron microscopy (TEM) measurements were made on a HITACHI H-8100 microscopy (Tokyo, Japan). The BET surface area, pore volume and pore size were measured on a Quantachrome NOVA 1000 system at liquid N₂ temperature. The

UV-vis spectra were recorded on a UV580C spectrophotometer. Fluorescent emission spectra were recorded on a RF-5301PC spectrofluorometer (Shimadzu, Japan). For photodegradation a 500 W xenon lamp (CHFXQ500W, Beijing) with cutoff filter ($\lambda > 420$ nm) was used.

Measurement of photocatalytic activity

The photocatalytic activity was evaluated by the photodegradation of MO dye in an aqueous solution under visible light irradiation. A500W Xe lamp with a 400 nm cutoff filter was used as the light source. In the experiment, 45 mg of photocatalyst was added into 15 mL of MO solution with a concentration of 10 mg L⁻¹. Prior to irradiation, the suspensions were magnetically stirred in the dark for 30 minutes to obtain the saturated absorption of MO onto the catalysts. At irradiation time intervals of every 0.5 hours, the suspensions were collected and then centrifuged (15000 rpm, 10 minutes) to remove the photocatalysts. The concentrations of the MO were monitored using an UV-vis spectrophotometer during the photodegradation process.

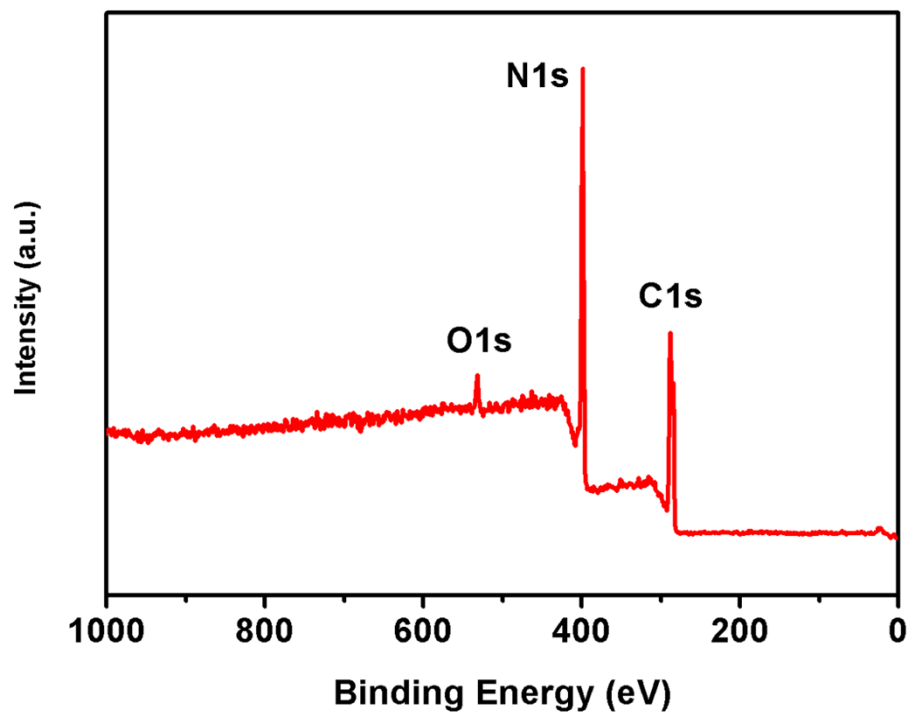


Fig. S1 XPS survey spectrum for hp-g-CN.

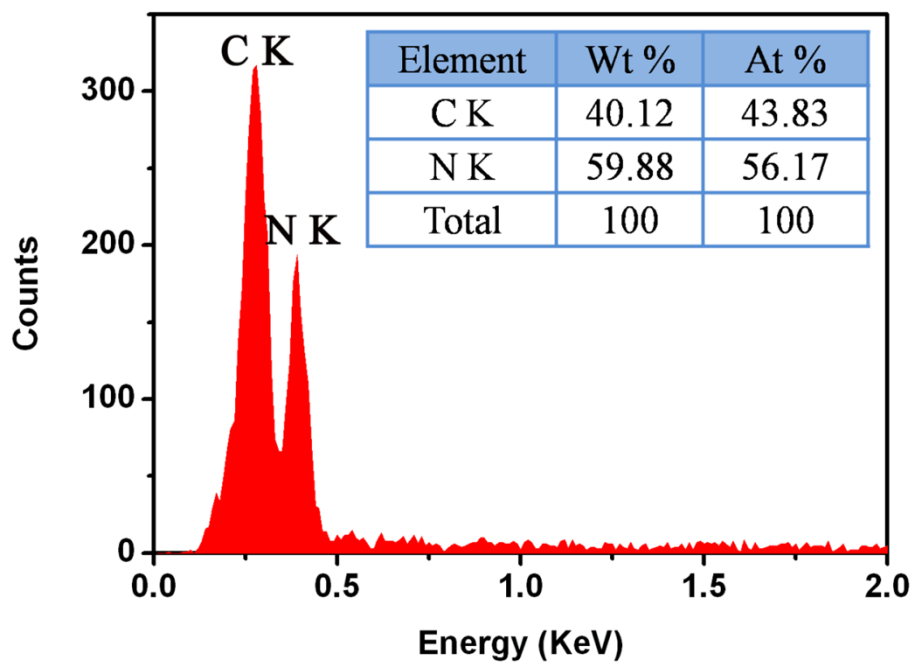


Fig. S2 EDX spectrum for hp-g-CN.

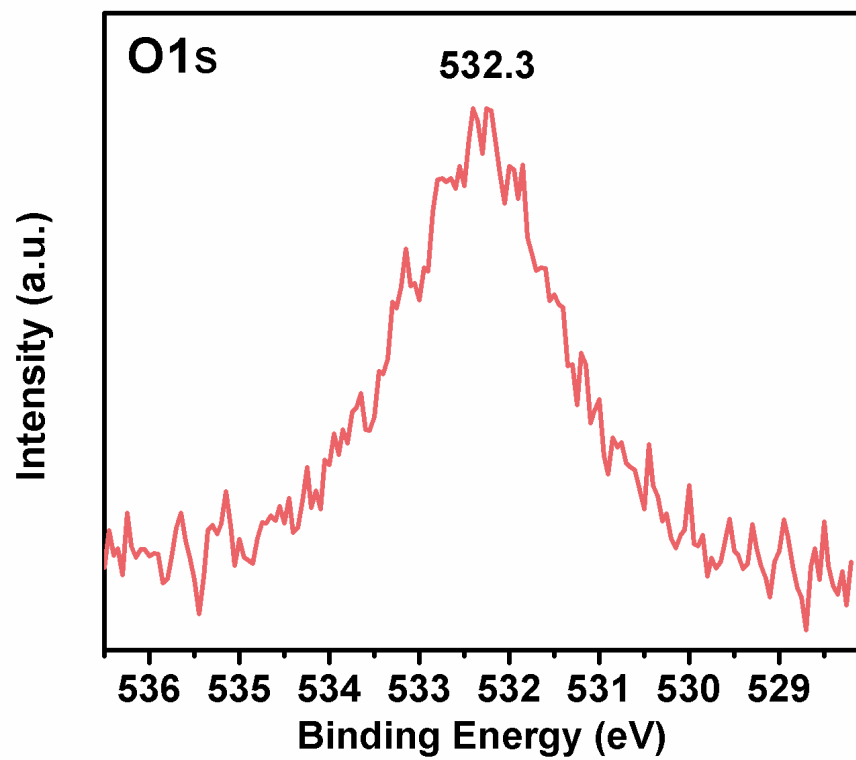


Fig. S3 XPS O 1s spectrum for hp-g-CN (the O At% is 2.07%).

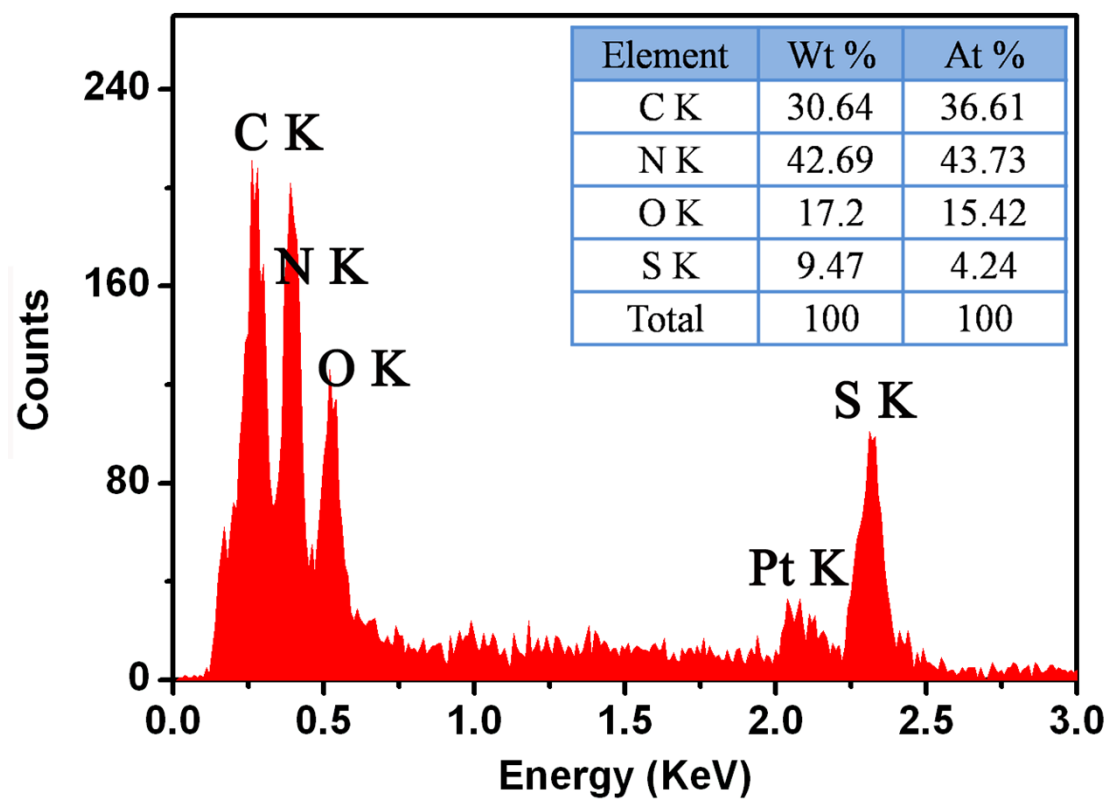


Fig. S4 EDX spectrum for the precursor.

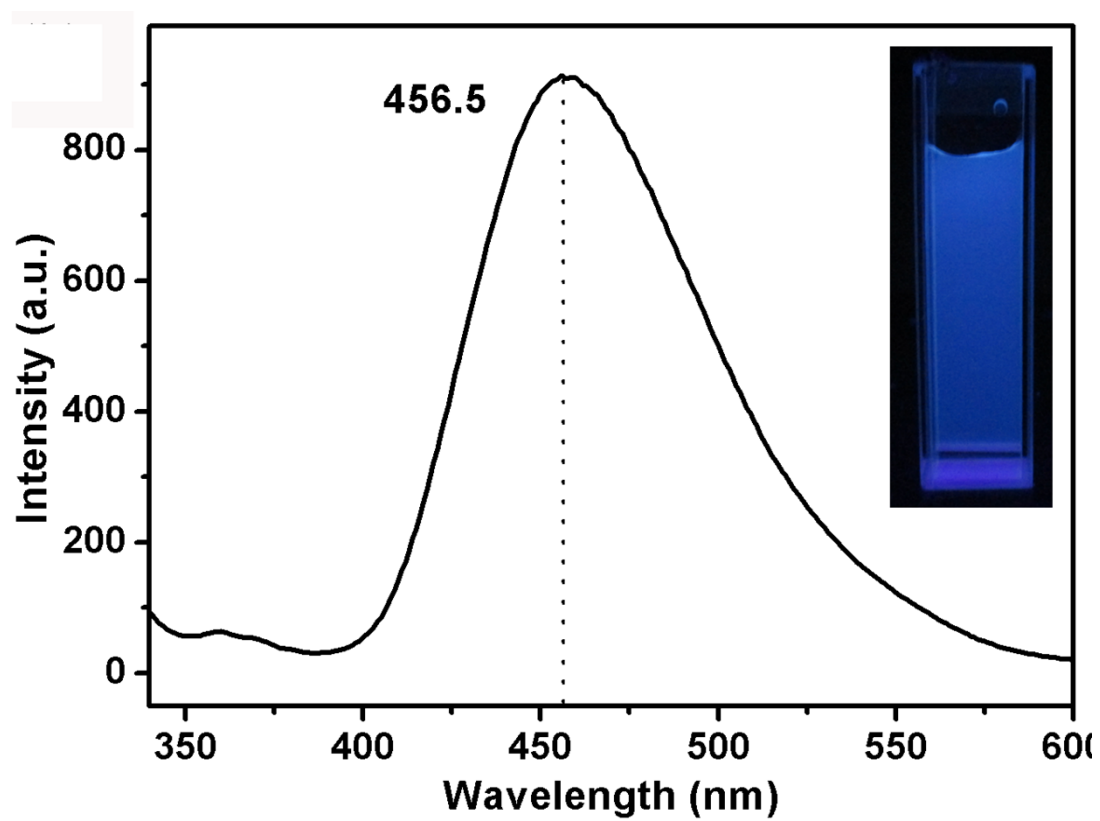


Fig. S5 PL spectrum of np-g-CN and a photograph of np-g-CN stimulated by a 330 nm laser (the inserted image).