Supporting Information

One-step electrochemical synthesis of ultrathin graphitic carbon nitride nanosheets and its application to the detection of uric acid

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1 Experimental

1.1 Materials

All chemicals were used as received without any further purification. Ultrapure water (18.2 MΩ; Millpore Co., USA) was used throughout the experiment.

1.2 Synthesis of g-C_3N_4

g-C_3N_4 was synthesized conveniently through one-pot electrochemical methods. Two platinum sheets (4 × 4 cm) were used as the positive and the negative electrodes and set in parallel at a distance of about 0.5 cm. Melamine (3 g), NaOH (1 g) and water (50 mL) mixture solution was used as the electrolytes solution. Static potentials of 5 V were applied to the two electrodes by a direct current (DC) power supply. The electrolytic process was performed under continuous stirring for about 40 min until the electrolytes solution turned yellow. Then, the product were centrifuged at a speed of 10000 rpm for 15 min to remove the un-reacted melamine and dialyzed against water through a dialysis bag (cut-off molecular weight 1000 Da) for 3 days.

1.3 Detection of H_2O_2 and uric acid

The detection of H_2O_2 is conducted by the following procedures: 100 μL of the as-synthesized g-C_3N_4 solution (0.74 mg mL^{-1}) was added into 790 μL NaAc buffer solution (20 mM, pH 4.0), followed by adding 100 μL of H_2O_2 solution with different concentrations, then 10 μL of TMB solution (50 mM in DMSO) was added, then kept in 37 °C bath for 30 min before absorbance measurement.

For the detection of uric acid, 50 μL of uricase (2 mg mL^{-1}) and 50 μL uric acid with different concentrations were first incubated at 37 °C for 30 min. Afterward, 10 μL of TMB, 100 μL of g-C_3N_4 solution (0.74 mg mL^{-1}), and 790 μL of NaAc solution (20 mM, pH 4.0) were added, and the mixture was further incubated at 37 °C for another 30 min before absorbance measurement.

1.4 Characterizations

Atomic force microscope (AFM) image of g-C_3N_4 was obtained using a MIPicoLE Atomic

Force Microscope (MI, USA). Transmission electron microscopy (TEM) images of g-C_3N_4 were obtained using a JEOL-1230 transmission electron microscope (JEOL, Japan). The sample for TEM characterization was-prepared by placing a drop of the colloidal solution on the carbon-coated copper grid and dried at room temperature. Fourier transform infrared spectra (FT-IR) in the 4000 to 400 cm^{-1} regions were recorded on a Nicolet Nexus 670 FT-IR spectroscope (Nicolet Instrument Co., USA). The UV-Vis spectra and the fluorescence spectra (FL) were obtained using a UV-2450 UV-Vis spectrophotometer (Shimadzu Co., Japan) and a F-4500 fluorescence spectrophotometer (Hitachi Ltd, Japan), respectively. X-ray photoelectron spectroscopy (XPS) analysis was done on an Thermo Fisher Scientific K-Alpha 1063 X-ray photoelectron spectrometer (Thermo Fisher Scientific, Britain) using Al, K as the exciting source. X-ray diffraction (XRD) patterns were collected using a Rigaku 2500 (Japan) X-ray diffractometer (XRD). ^{13}C NMR spectra were recorded using a NMR spectrometer (Bruker biospin 400MHz). Elemental analysis was done on Vario MAX CN ELEMENTAR (Elementar, Germany).

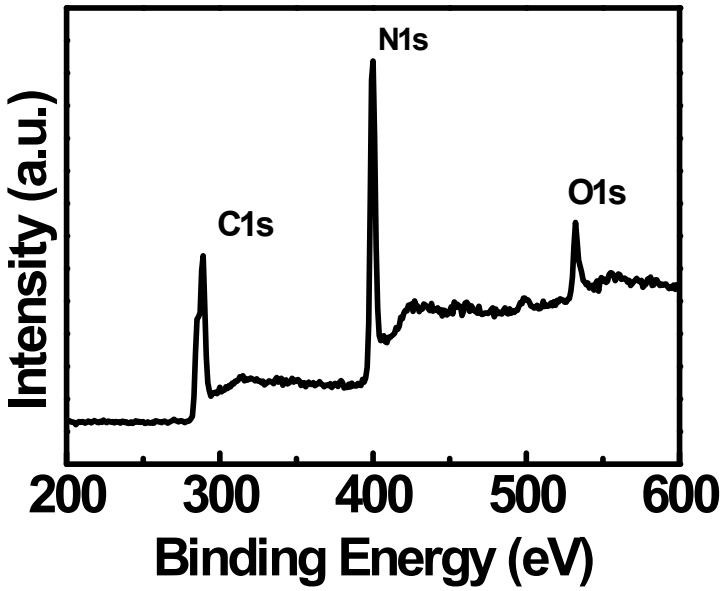

Fig. S1 XPS survey spectrum of g-C_3N_4.

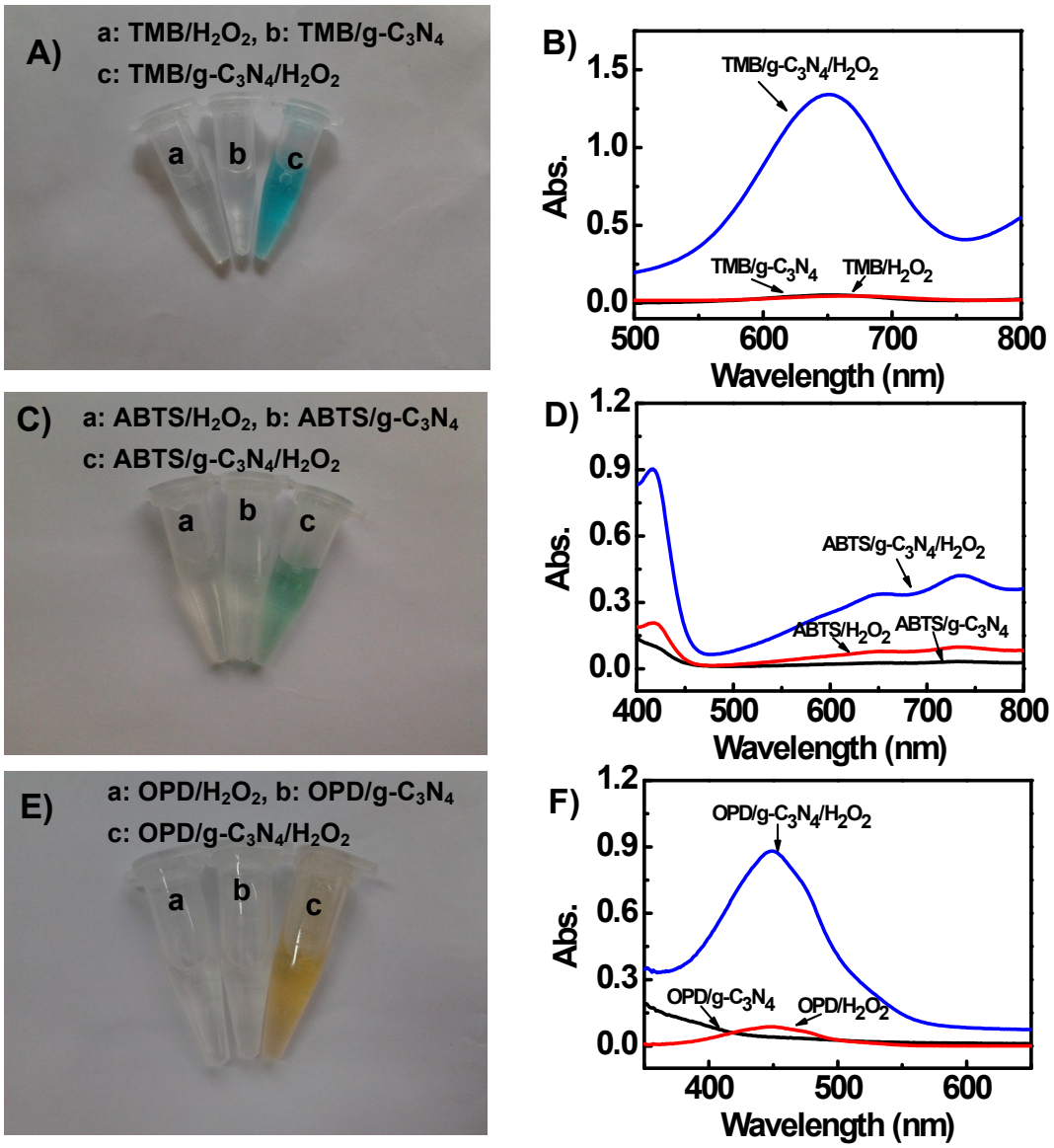

Fig. S2 (A, C, E) the optical photographs of aqueous solutions of (a) TMB (ABTS or OPD)/H_2O_2, (b) TMB (ABTS or OPD)/g-C_3N_4, and (c) TMB (ABTS or OPD)/g-C_3N_4/H_2O_2, (B, D, F) corresponding UV-vis spectra. The concentration of g-C_3N_4, H_2O_2, and TMB (ABTS or OPD) were 0.07 mg mL^{-1}, 1 mM, and 0.5 mM, respectively. The incubation temperature is 37 °C. The incubation time is 30 min.

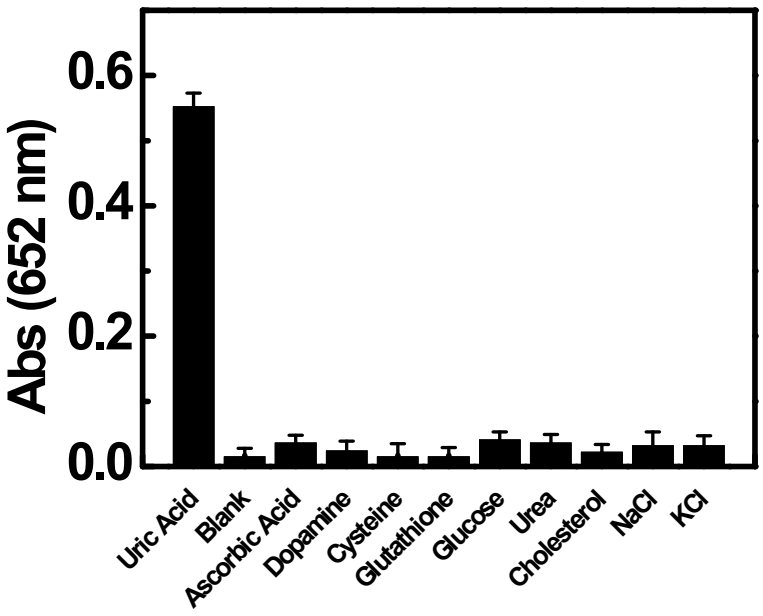

Fig. S3 Selectivity analysis for uric acid detection by mornitoring the relative absorbance. The concentration of uric acid and other substances is 0.1 mM and 5 mM, respectively.