

Electronic Supplementary Information

Graphitic carbon nitride nanosheets: one-step high-yield synthesis and application for Cu²⁺ detection

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Experimental section

Material: KBH₄ and Sodium hexametaphosphate were purchased from Aladdin Ltd. (Shanghai, China). Na₂SO₄, Na₂S₂O₈, Tris, HCl, Co(NO₃)₂·6H₂O, Fe(NO₃)₃·9H₂O, Hg(NO₃)₂, Mg(NO₃)₂·6H₂O, Ni(NO₃)₂·6H₂O, Pb(NO₃)₂, Zn(NO₃)₂·6H₂O, Mn(NO₃)₂ and melamine were purchased from Beijing Chemical Corp. All chemicals were used as received without further purification.

Characterizations: SEM measurements were made on a XL30 ESEM FEG scanning electron microscope at an accelerating voltage of 20 kV. AFM analysis was taken with MultiMode-V (Veeco Metrology, Tnc.). TEM measurements were made on a Hitachi H-8100 EM (Hitachi, Tokyo, Japan) with an accelerating applied potential of 200 kV. XRD data were collected using a RigakuD/MAX 2550 diffractometer with Cu K α radiation ($\lambda=1.5418$ Å). The UV-vis spectra were recorded on a UV580C spectrophotometer. RF-5301PC was used to record the fluorescent emission spectra. The ECL curves were recorded using a MPI-A electrochemiluminescence analyzer system (Xi'an Remax Analysis Instrument Co., Ltd., Xi'an, China).

Preparation of g-C₃N₄ nanosheets and b-g-C₃N₄: g-C₃N₄ nanosheets were prepared as follows. In brief, melamine and KBH₄ with a mole ratio of 5:1 were mixed together

and heated at 550°C for 4 h in Ar atmosphere. 0.5 g products were dispersed in 500 mL water for characterization and further use. For comparison, b-g-C₃N₄ was obtained using the same procedure without the presence of KBH₄.

Detection of Cu²⁺: The detection of Cu²⁺ was performed in tris-HCl (pH =7.0) at room temperature. In detail, 4.5 μL of g-C₃N₄ nanosheets dispersion was added into 250 μL of tris-HCl buffer first, then certain amount of Cu²⁺ was added to it. The fluorescent emission spectra were studied at room temperature after reaction for 10 min.

Analysis of real water samples: The real water samples were taken from the South Lake of Changchun, Jilin province, China. These samples were filtered through a 0.22 μm membrane and then centrifuged at 12000 for 10 min. The resultant water samples were spiked with standard solutions containing different concentrations of Cu²⁺.

Preparation of g-C₃N₄ nanosheets modified FTO glass: 100 μL g-C₃N₄ nanosheets dispersion and 10 μL of Nafion (0.5 wt%) were dropped on cleaned FTO glass and dried in air for further use.

Electrochemistry and electrochemiluminescence of g-C₃N₄ nanosheets: ECL investigations were carried out in 0.1 M Na₂SO₄ containing 3 mM Na₂S₂O₈. ECL signals were obtained by cyclic voltammetry between 0 to -1.3V with a three electrode system, using Ag/AgCl as reference electrode, Pt wire as counter electrode and g-C₃N₄ nanosheets modified FTO glass as working electrode.

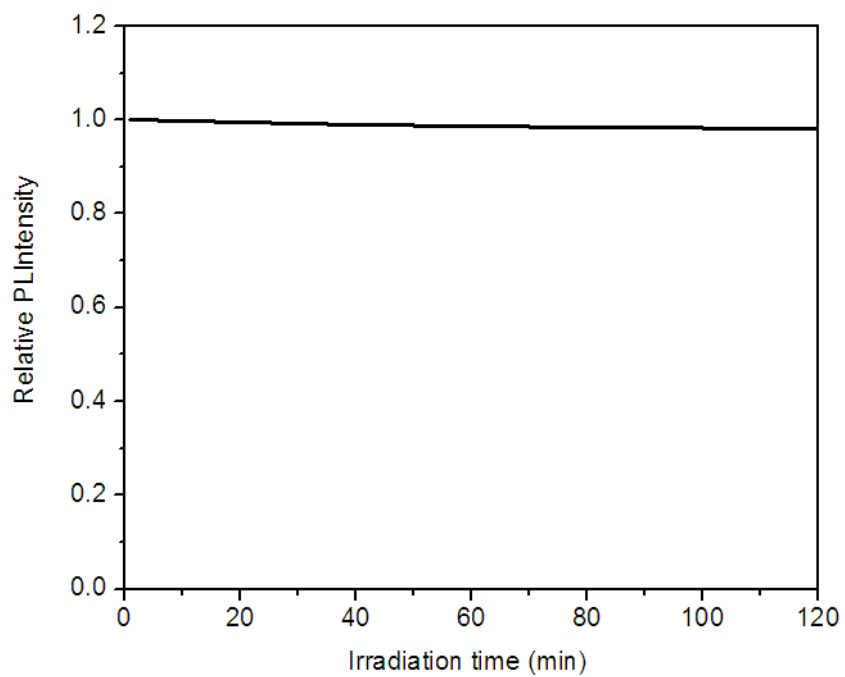
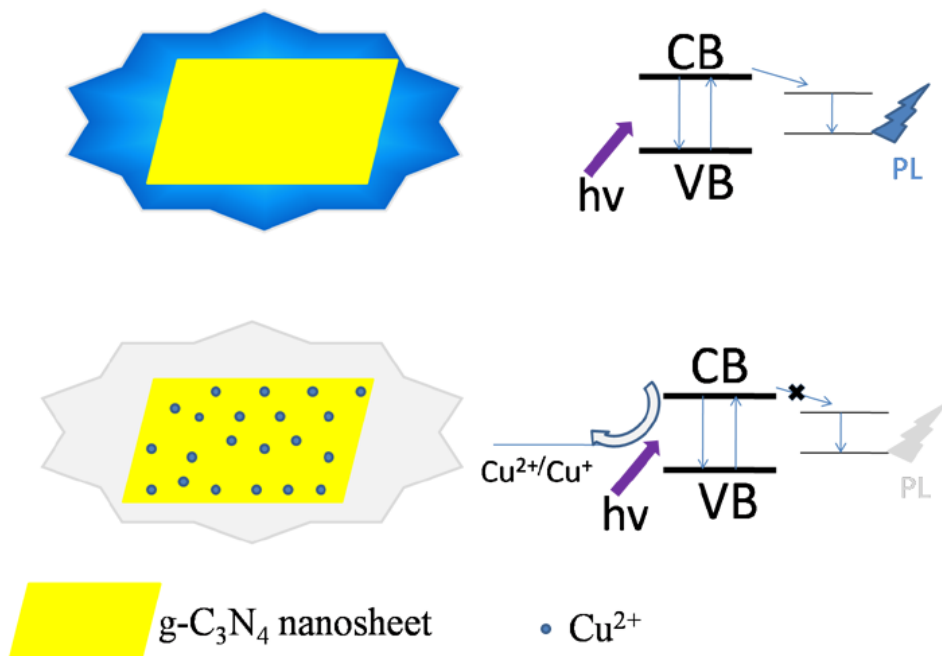


Fig. S1 Curve of PL intensity of the g-C₃N₄ nanosheet and irradiation time.



Scheme S1

Table S1 Comparison of sensing performance of different fluorescent probes for Cu²⁺ detection.

Fuorosensor	Detection limit (nM)	Linear range (nM)	Ref.
CdS QDs	100	-	4a
16-MHA capped CdSe QDs	5	5-1×10 ⁵	4b
PPNDs	1	0-5×10 ⁴	6
c-mpg-C ₃ N ₄	12.3	10-100	11
ultrathin g-C ₃ N ₄ nanosheets	0.5	0-1×10 ⁴	12
F-g-C ₃ N ₄ dots	0.5	0-5×10 ⁴	19
pyridoxal-based chemosensor	140	0-5×10 ⁴	20a
BCNO NPs	100	0-5×10 ⁴	20b
g-C ₃ N ₄ nanosheets	0.5	0-1×10 ³	This work

Table S2. Selectivity coefficients of Cu^{2+} against other metal ions.

Metal ions	Selectivity coefficient
Co^{2+}	21.26
Fe^{3+}	18.58
Hg^{2+}	50.01
Mg^{2+}	11.83
Mn^{2+}	34.84
Ni^{2+}	27.21
Pb^{2+}	21.56
Zn^{2+}	11.61

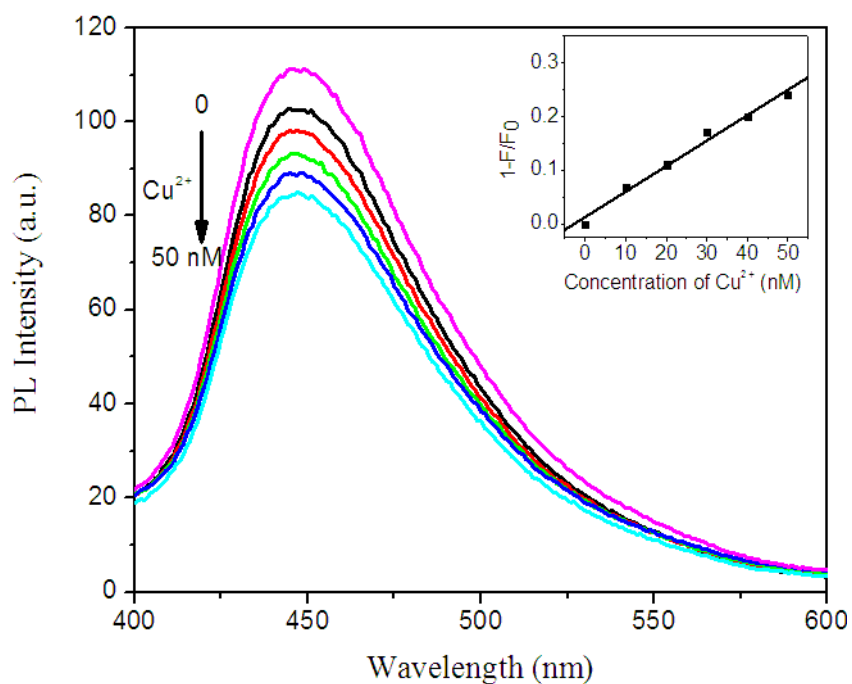


Fig. S2 PL spectra of g-C₃N₄ nanosheets dispersion in the presence of different Cu²⁺ concentration (from top to bottom: 0, 10, 20, 30, 40, 50 nM) in lake water. Inset: dependent of $1-F/F_0$ on the concentration of Cu²⁺ ions within the range of 0-50 nM (excitation at 335 nm; F_0 and F are the g-C₃N₄ nanosheets fluorescence intensities at 450 nm in the absence and presence of Cu²⁺ ions, respectively).