ELECTRONIC SUPPORTING INFORMATION (ESI) FOR:

Fluorescent sensor for selective detection of cyanide using mesoporous graphitic carbon(IV) nitride

Eun Zoo Lee, Sun Uk Lee, Nam-Su Heo, Galen D. Stucky, Young-Si Jun* and Won Hi Hong*

Experimental

Synthesis of 3D cubic mesoporous silica, KIT-6

P123 (6 g) was dissolved in 0.5 M HCl aqueous solution (228 g). And then, 1-butnaol (6 g) was added and stirred for 1 hr at 35 °C. TEOS (tetraethyl orthosilicate; 12.9 g) was added and stirred for 1 day. The mixture was heated for 1 day at 130 °C and the resulting white precipitate was calcined for 4 hr at 550 °C in air.

Synthesis of 3D cubic mesoporous g-C_3N_4

Silica template (1 g) was impregnated in 7 mM cyanamide aqueous solution, and the mixture was stirred for 1 hr. Subsequently, the mixture was centrifuged, dried, and calcined under nitrogen for 4 hr at 550 °C.

Synthesis of Cu^{2+}-c-mpg-C_3N_4

1 mM $Cu(NO_3)_2$ (10 ml) in 10 mM tris-HCl buffer (pH 7.4) was mixed with c-mpg-C_3N_4 (10 mg). The mixture was stirred for 30 min at room temperature and then centrifuged for 10 min at 4000 rpm. After removal of supernatant, Cu^{2+}-c-mpg-C_3N_4 was rinsed with 10 mM tris-HCl buffer to remove excessive Cu^{2+}.

Characterization of g-C_3N_4

TEM image was taken with JEOL FB-2100F (HR) at acceleration voltage of 200 kV. Characterization by XRD was carried out in reflection mode (CuKα radiation) on a Rigaku D/MAX-2500 diffractometer. Elemental analysis was conducted three times on different batches of g-C_3N_4s using a Vario EL 3 elemental analyzer manufactured by Elementar. The standard deviation of the atomic weight percentage was lower than 0.36% for carbon, 0.7% for nitrogen, and 0.08% for hydrogen. The adsorption/desorption isotherms of nitrogen at -196 °C were measured using a Micromeritics ASAP 2020. The Brunauer–Emmett–Teller (BET) equation was used to calculate the apparent surface area from adsorption data obtained at P/P_0 between 0.05 and 0.2. The total volume of the micro- and mesopores was calculated from the amount of nitrogen adsorbed at P/P_0=0.99, assuming that adsorption on the external surface was negligible relative to adsorption in the pores. The pore size distribution was evaluated by BJH method using the adsorption branch.

Measuring photoluminescence of g-C_3N_4

CN^- solution (10 ml) in 10 mM tri-HCl buffer at pH 7.4 with various concentrations was added to Cu^{2+}-c-mpg-C_3N_4 (10 mg) in a glass vial. The mixture was stirred for 10 min at room temperature. And then, the suspension (0.2 ml) was sampled and PL spectrum was measured. All PL spectra were obtained by microplate spectrophotometer (Gemini EM-Molecular Devices, USA). Fluorescence images were recorded using confocal microscopy (LSM 5 PASCAL, Carl Zeiss, USA).

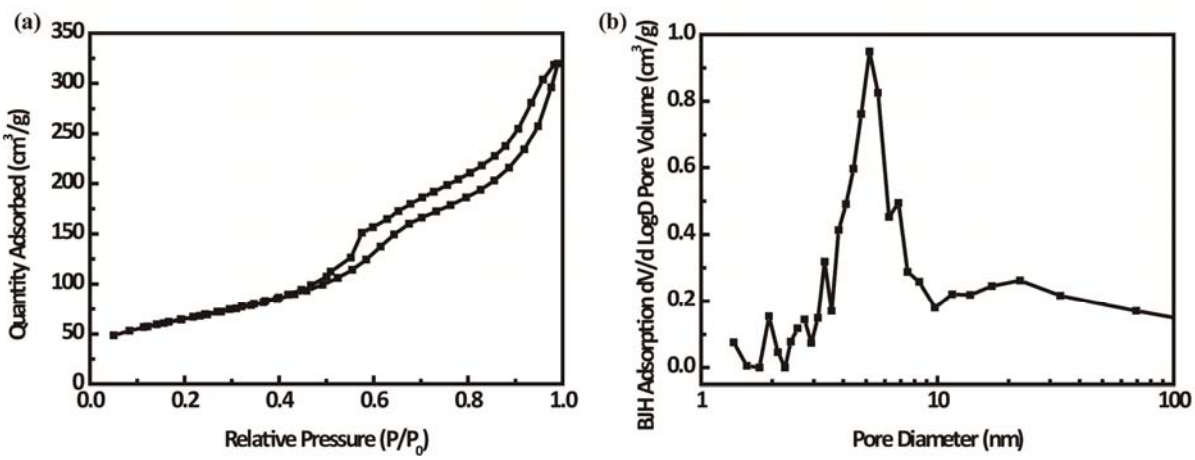

Fig. S1 Nitrogen sorption isotherm and pore size distribution calculated from the adsorption branch by BJH method.

Table S1 Textural properties of c-mpg-C_3N_4.

Material	Surface area S_{bet} (m^2/g)	Pore volume (cm^3/g)	Pore size[a] (nm)	a[b] [nm]	Wall thickness[c] (nm)
c-mpg-C_3N_4	234	0.5	5.2	22.6	8.6

[a] Pore size is calculated from the adsorption branch of nitrogen sorption isotherm by the BJH method.
[b] XRD unit cell parameter, a, is calculated from the equation; $a=6^{1/2}d_{211}$.
[c] Wall thickness is estimated from TEM images.

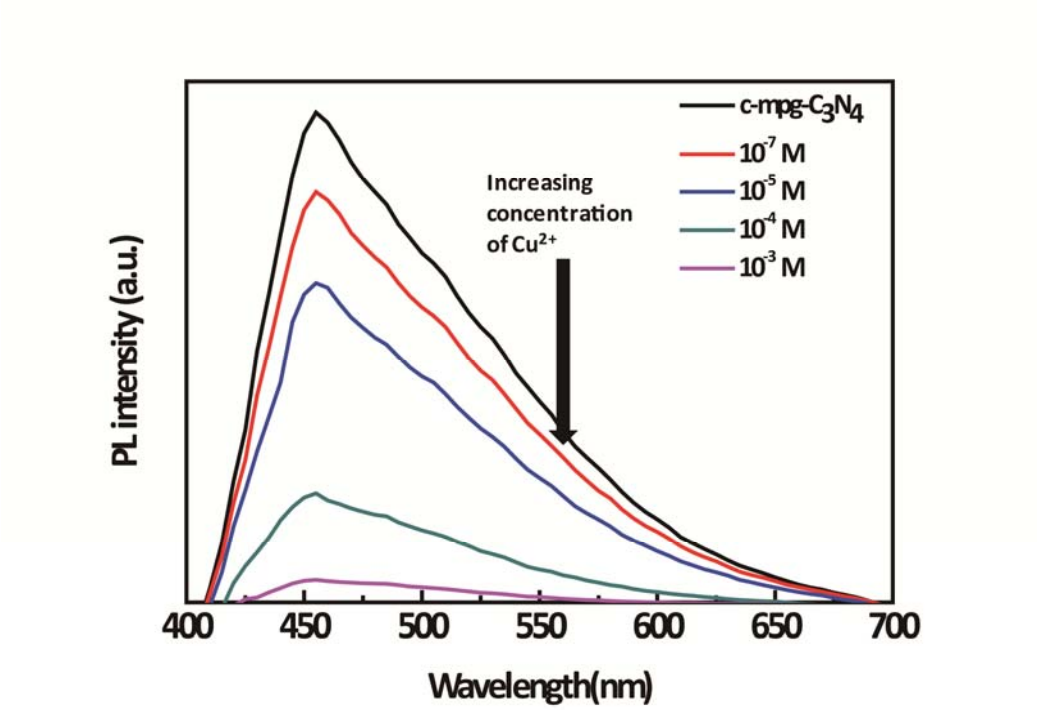

Fig. S2 PL spectra of c-mpg-C_3N_4 with increasing concentration of Cu^{2+} from 10^{-7} to 10^{-3} M.

Table S 2 PL response (I/I_0) of Cu^{2+}-c-mpg-C_3N_4 by adding various concentration of CN^- in buffer solution and in serum, respectively.

Concentration of CN^-	**10^{-6} M**	**10^{-5} M**	**10^{-4} M**	**10^{-3} M**
In buffer	6.542	9.645	13.037	17.569
In serum	5.983	9.328	12.968	17.193