

Supplementary Information

Exfoliated graphene-like carbon nitride in organic solvents: the enhanced photocatalytic activity and highly selective and sensitive sensor for the detection of trace amount of Cu²⁺

Xiaojie She,^a Hui Xu,^a Yuanguo Xu,^a Jia Yan,^a Jiexiang Xia,^a Li Xu,^a Yanhua Song,^b Yan Jiang,^b Qi Zhang^{*a} and Huaming Li^{*a}

^a School of Chemistry and Chemical Engineering, Jiangsu University, Zhenjiang 212013, P. R. China

^b School of Material Science and Engineering, Jiangsu University, Zhenjiang 212013, P. R. China

*Corresponding author: Tel.: +86-511-88791800; Fax: +86-511-88791708;

E-mail address: qzhang@ujs.edu.cn, lihm@ujs.edu.cn

Characterizations: The samples were characterized by X-ray diffraction (XRD) by Bruker D8 diffractometer with Cu K α radiation ($\lambda=1.5418\text{\AA}$) in the range of $2\theta=10-80^\circ$. The transmission electron microscopy (TEM) images, was carried out on a JEOL-JEM-2010 (JEOL, Japan) operated at 200 kV. Ultraviolet visible (UV-vis) diffuse reflection spectra were measured using a UV-vis spectrophotometer (Shimadzu UV-2450, Japan) in the range of 200 to 800 nm. BaSO₄ was used as the reflectance standard material. The Fourier transform infrared spectra (FT-IR) of the samples were recorded using Nicolet Nexus 470 spectrometer. The nitrogen adsorption-desorption isotherms at 77 K were investigated using a TriStar II 3020 surface area and porosity analyzer (Micromeritics Instrument Corporation, USA). The photoluminescence (PL) spectra of the samples were obtained by a QuantaMaster & TimeMaster Spectrofluorometer with an excitation wavelength at 325 nm. The photocurrents were measured with an electrochemical analyzer (CHI660B, Chen Hua Instruments, Shanghai, China) in a standard three-electrode system, which employed a platinum wire as the counter electrode, indium-tin oxide glass (ITO) as the working electrode, and Ag/AgCl (saturated KCl solution) as the reference electrode. 5 mg the graphene-like C₃N₄ powder was dispersed ultrasonically in 1 mL of ethanol, and 20 μL of the resulting colloidal dispersion (5 mg/mL) was drop-cast onto a piece of ITO slice with a fixed area of 0.5 cm² and dried under the infrared lamp to form the graphene-like C₃N₄ modified ITO electrode. All the photocurrent measurements were performed at a constant potential of -0.2 V (vs. SCE). PBS was used as the supporting electrolyte for photocurrent measurements. A 500-W Xe arc lamp was utilized as the light source.



Figure S1. Comparison of the exfoliation efficiency between various solvents. The solvents were: (a) 1,3-butanediol (1,3-BUT), (b) cyclohexanone, (c) methylbenzene, (d) N,N-Dimethylacetamide (DMA). From the photograph above, it can be known that only 1,3-BUT can exfoliate the bulk $g\text{-C}_3\text{N}_4$ and the graphene-like C_3N_4 can be kept the suspension steadily. What's more, they have been kept for more 5 months.

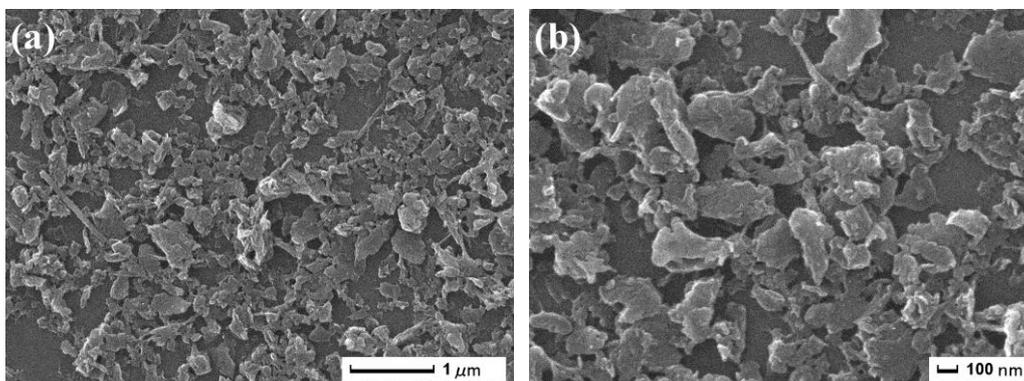


Figure S2. (a) and (b) SEM images of the graphene-like C_3N_4 .

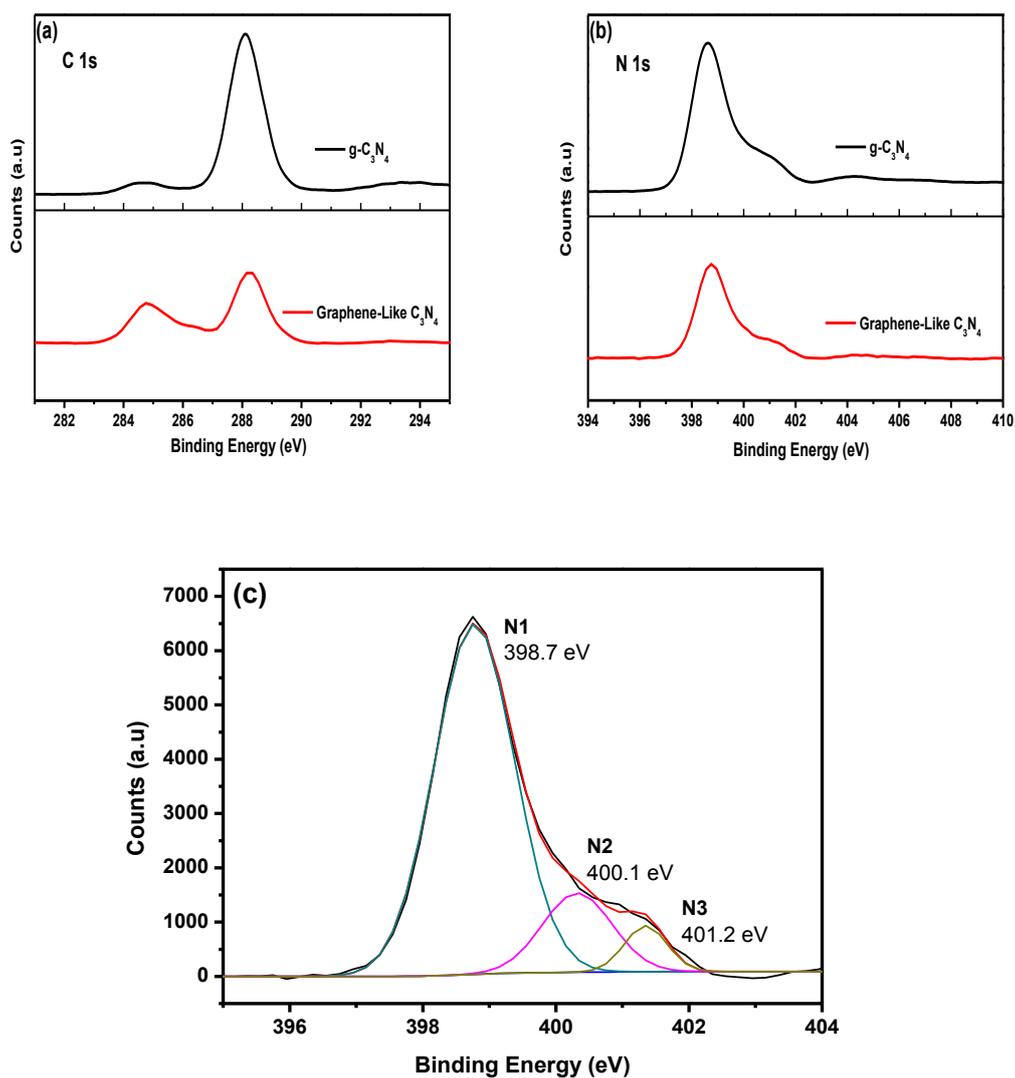


Figure S3. C 1s (a) and N 1s (b) XPS spectra, (c) High-resolution N1s spectra of the graphene-like C₃N₄, fitted to three energy components centered at around 398.7 (N1), 400.1 (N2) and 401.2 (N3) eV.

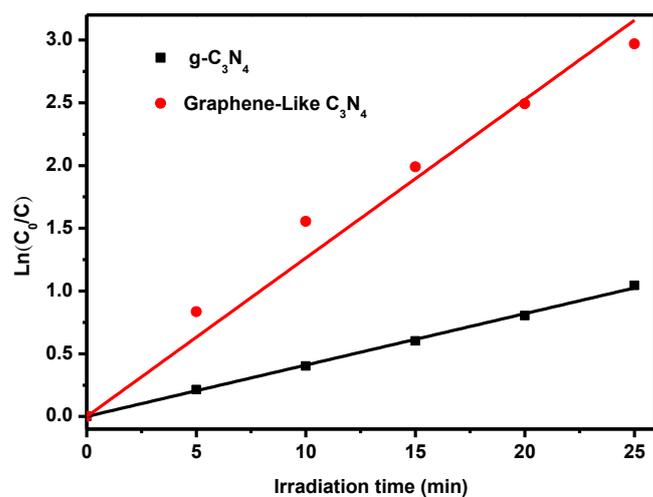


Figure S4. The kinetics of MB degradation using various photocatalysts under visible-light irradiation.

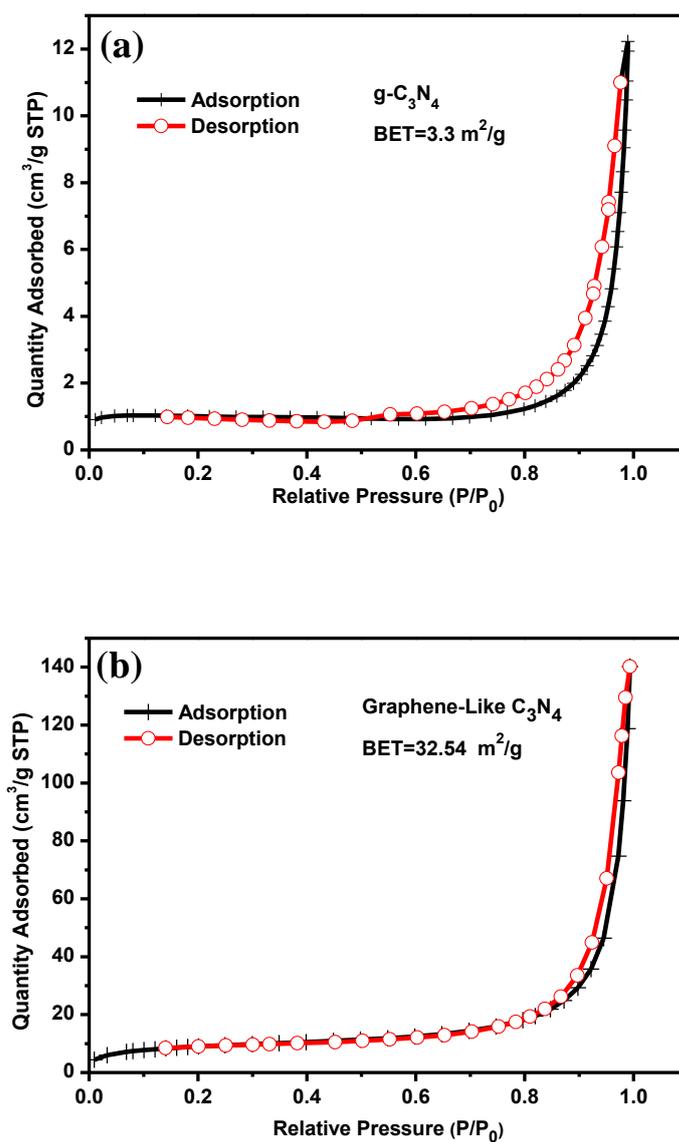


Figure S5. (a) Nitrogen adsorption-desorption isotherms of g-C₃N₄ and (b) the graphene-like C₃N₄.

Table S1. Kinetic constants and regression coefficients of MB degradation under visible light irradiation.

Photocatalysts	Kinetic constant (k , min ⁻¹)	R^2
g-C ₃ N ₄	0.0409	0.9995
graphene-like C ₃ N ₄	0.1262	0.9906