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 Cu$^{2+}$

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 Kα radiation (λ=1.5418 Å) in the range of 2θ=10-80°. 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-butane diol (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-C₃N₄ and the graphene-like C₃N₄ 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 C₃N₄.
Figuge S3. C 1s (a) and N 1s (b) XPS spectra, (c) High-resolution N1s spectra of the graphene-like C$_3$N$_4$, 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 absorption-desorption isotherms of g-C$_3$N$_4$ and (b) the graphene-like C$_3$N$_4$.

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

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<thead>
<tr>
<th>Photocatalysts</th>
<th>Kinetic constant (k, min$^{-1}$)</th>
<th>$R^2$</th>
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<tbody>
<tr>
<td>g-C$_3$N$_4$</td>
<td>0.0409</td>
<td>0.9995</td>
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<tr>
<td>graphene-like C$_3$N$_4$</td>
<td>0.1262</td>
<td>0.9906</td>
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