Supporting Information

Synthesis of g-C_3N_4 prepared at different temperatures for superior visible/UV photocatalytic performance and photoelectrochemical sensing of MB solution

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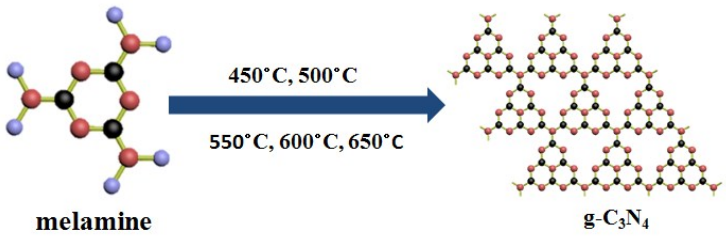

Fig. S1 Schematic illustration of g-C_3N_4 prepared at different temperatures (Black: C, Red: N, Blue: H).

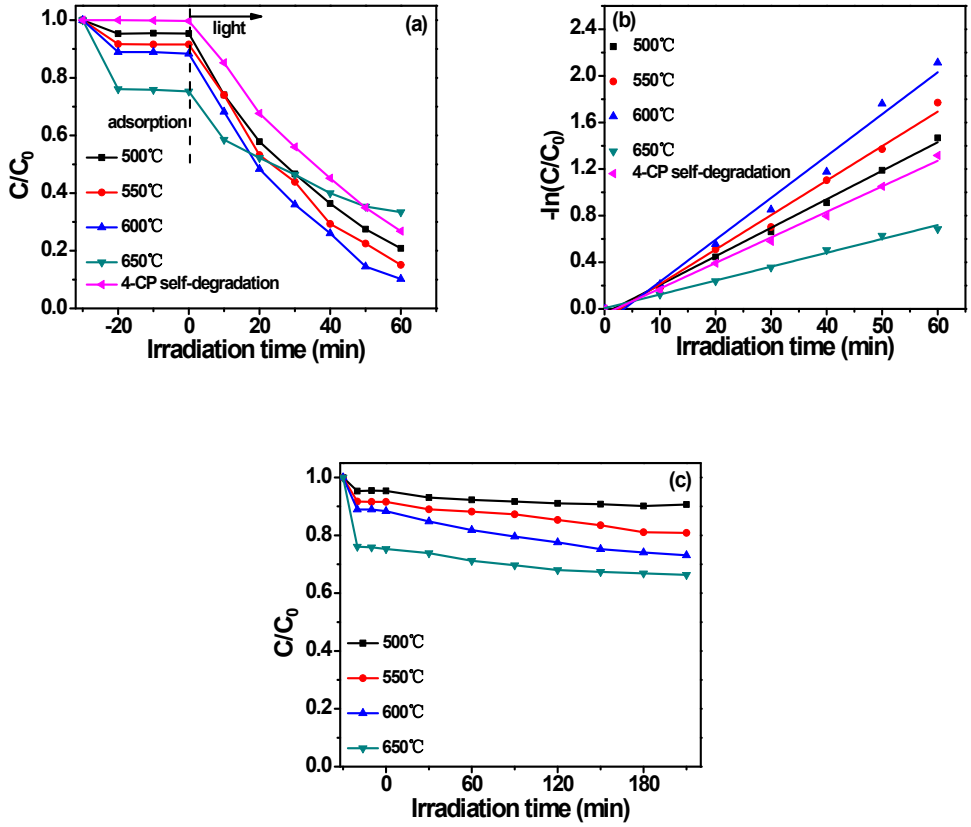

Fig. S2 (a) Photocatalytic activity of g-C_3N_4 prepared at different temperatures for the degradation of 4-CP under UV-light irradiation; (b) Kinetic fit for the degradation of 4-CP under UV-light irradiation with g-C_3N_4 prepared at different temperatures; (c) Photocatalytic activity of g-C_3N_4 prepared at different temperatures for the degradation of 4-CP under visible light irradiation.

The adsorption test results showed that the absorption-desorption equilibrium has been reached. The adsorption efficiencies of g-C_3N_4 prepared at 500, 550, 600°C and

650°C were about 4.64%, 8.45%, 11.66% and 24.73% for 4-CP, respectively. The g-C_3N_4 prepared at 600°C showed the highest photocatalytic activity, which was about 89.81% degraded after UV light irradiation for 1 h. The photocatalytic degradation efficiency of g-C_3N_4 prepared at 500 and 550°C was about 79.18%, 84.90%, respectively. The results indicated that the higher calcination temperature may enhance the photocatalytic degradation efficiency. However, the photocatalytic degradation efficiency of g-C_3N_4 prepared at 650°C was lowest, which was about 66.62%. In a recent paper, photocatalytic experiment also illustrated that the photocatalytic degradation efficiency of self-degradation was higher than the photocatalytic degradation efficiency which added photocatalyst.[1,2] The photocatalytic reaction was a complicated process which was closely related not only the band structure, but also the surface state of photocatalyst.[3] The decreased activity may be due to the higher value of band gap and decreasing ultraviolet light absorption ability.

The linear relationship between $ln(C_0/C)$ and the reaction time for 4-CP was also shown in the Fig. S2b and the reaction rate constant (k) and relative coefficient (R^2) were summarized in *Table S2*. For g-C_3N_4 prepared at 500, 550, 600 and 650°C, the corresponding reaction rate constants (k) were calculated to be 0.0245 min^{-1}, 0.0296 min^{-1}, 0.0359 min^{-1} and 0.0119 min^{-1}, respectively.

As shown in Fig S2c, the adsorption efficiencies of g-C_3N_4 prepared at 500, 550, 600°C and 650°C were about 4.64%, 8.45%, 11.66% and 24.73% for 4-CP, respectively. The photocatalytic degradation efficiency of g-C_3N_4 prepared at 500, 550, 600°C and 650°C were about 9.34%, 19.28%, 26.91%, 33.65%, respectively. Obviously, the photocatalytic degradation efficiency of 4-CP under visible light irradiation was lower than under UV-light irradiation, as shown in Fig S2c.

Table S1 Kinetic Constants (k, h^{-1}) and relative coefficient (R^2) for the degradation of MB under visible light irradiation.

Photocatalysts	Kinetic constant (k, h^{-1})	R^2
g-C_3N_4(500 °C)	0.0315	0.9609
g-C_3N_4(550 °C)	0.0545	0.9957
g-C_3N_4(600 °C)	0.0765	0.9813
g-C_3N_4(650 °C)	0.3619	0.9970

Table S2 Kinetic Constants (k, min^{-1}) and relative coefficient (R^2) for the degradation of 4-CP under visible light irradiation.

Photocatalysts	Kinetic constant (k, min^{-1})	R^2
g-C_3N_4(500°C)	0.0245	0.9964
g-C_3N_4(550°C)	0.0296	0.9878
g-C_3N_4(600°C)	0.0359	0.9800
g-C_3N_4(650°C)	0.0119	0.9922

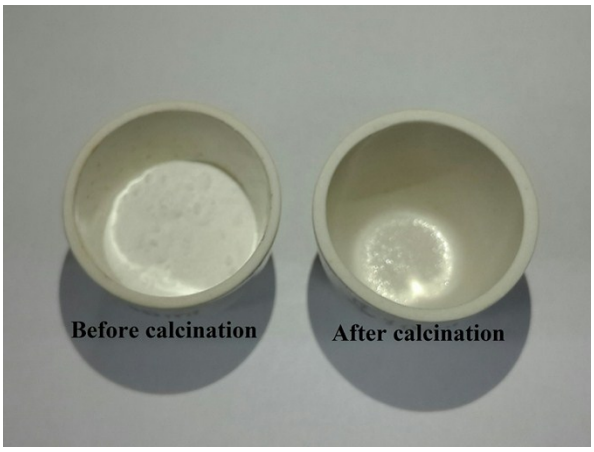

Fig. S3 Photographs of alumina crucible before calcination and after calcination.

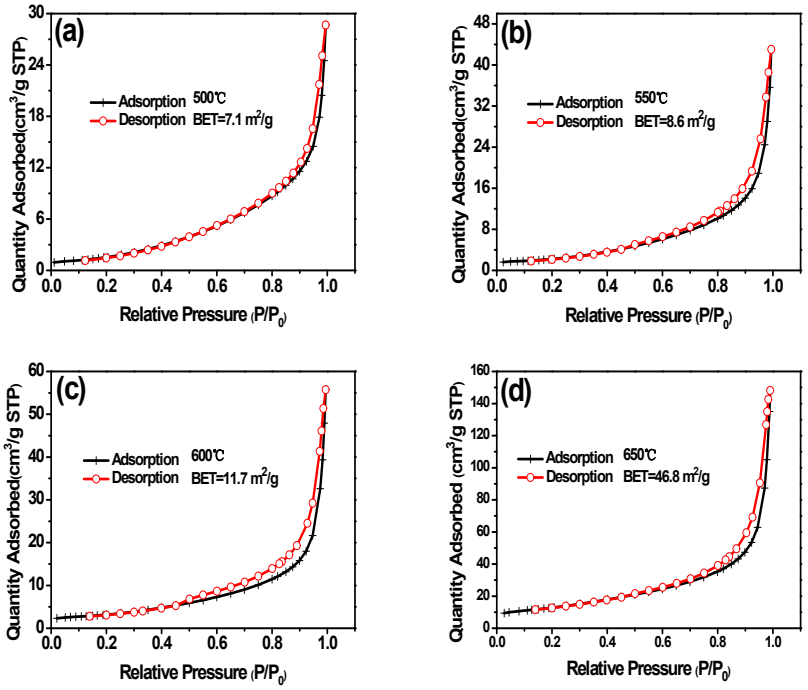

Fig. S4 Nitrogen adsorption-desorption isotherms of g-C_3N_4 prepared at different temperatures (a) 500°C, (b) 550°C, (c) 600°C, (d) 650°C.

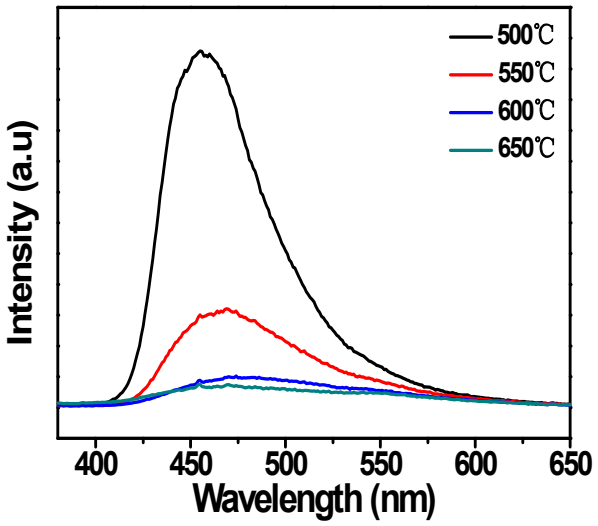

Fig. S5 The PL spectra of g-C_3N_4 prepared at different temperatures.

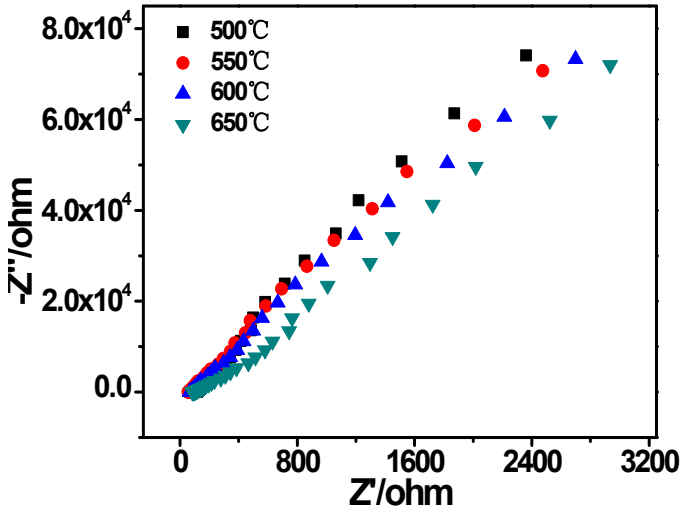

Fig. S6 ESI Nyquist plots of g-C_3N_4 prepared at different temperatures in dark ([Na_2SO_4]=0.1 M).

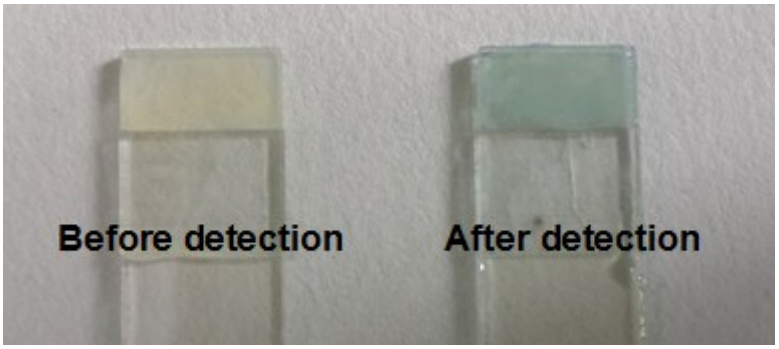

Fig. S7 Photographs of the Pt electrode before detection and after detection.

References:

[1] H. Y. Ji, X. C. Jing, Y. G. Xu, J. Yan, H. P. Li, Y. P. Li, L. Y. Huang, Q. Zhang, H. Xu, H. M. Li, *RSC Adv.*, 2015, **5**, 64299-64299.

[2] R. Sharma, S. Bansal and S. Singhal, *RSC Adv.*, 2015, **5**, 6006-6018.

[3] B. Klahr, S. Gimenez, F. Fabregat-Santiago, T. Hamann and J. Bisquert, *J. Am. Chem. Soc.*, 2012, **134**, 4294-4302.