

Supplementary material

Mesoporous silica-based carbon dot-carbon nitride composite for efficient photocatalysis

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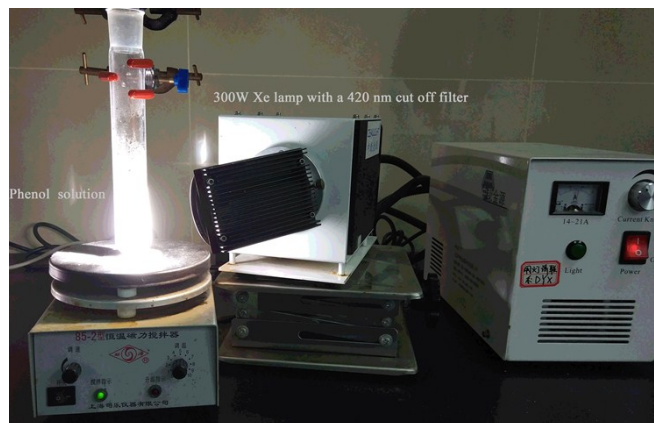


Fig. S1 The photo of the irradiation system

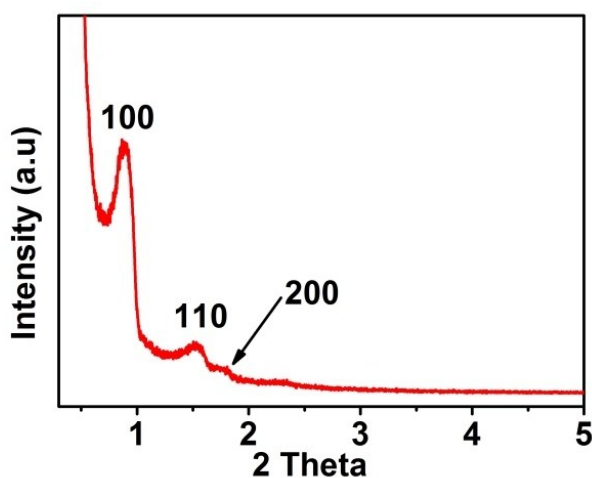


Fig. S2 Small -angle XRD pattern of CD-SBA15

As we can see from the data, there are three clear peaks (100,110,200), which are characteristic of hexagonally ordered structure of SBA-15[1], indicating the sample has highly ordered mesoporous structures. This result is consistent with the result from TEM (Fig. 3a and c) and BET (Fig. 2)

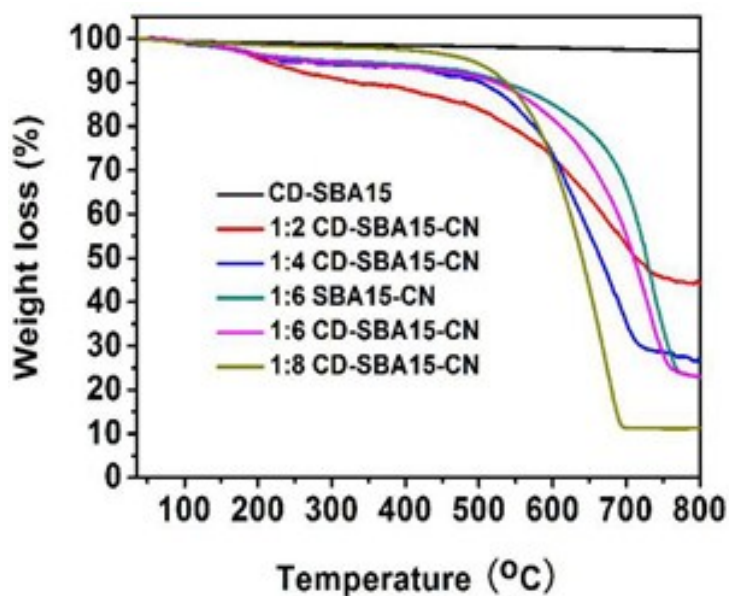


Fig. S3 TG data of different samples

TG analysis

TG measurement is carried out to analyze the actual loading amounts of carbon nitride on CD-SBA15. As shown in S3, CD-SBA15 shows a weight loss of 3.8 wt % when the temperature is elevated from 40 to 800 °C, which is associated with the CDs and physically adsorbed H₂O in the sample. For CD-SBA15-CN, expect for a little weight loss below 250°C, the samples are thermally stable in a wide range of temperatures. With the temperatures raised above 550°C, the TG curves exhibit obvious declines because the g-C₃N₄ starts self-decomposing and the total decomposition is finished at 750°C. According to the TG results, the loading amounts of g-C₃N₄ are calculated, which are 52.8, 70.1, 74.1, 74.0, and 85.8 wt% for 1:2 CD-SBA15-CN, 1:4 CD-SBA15-CN, 1:6 CD-SBA15-CN, 1:6 SBA15-CN, and 1:8 CD-SBA15-CN, respectively.

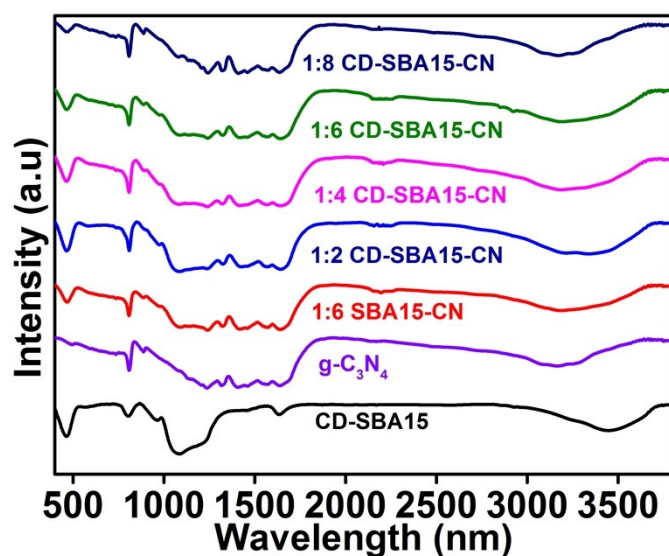


Fig. S4 FTIR spectra of different samples.

FTIR measurement

Fig S4 shows the comparison of the FTIR spectra of different samples, as we can see the spectrum of CD-SBA15 reveals three bands at 470 cm⁻¹, 806 cm⁻¹ and 1089 cm⁻¹ attributed to the condensed silica (Si-O-Si) network² and the band at 1019 cm⁻¹(C-O), 1654cm⁻¹(C=O), and 3363cm⁻¹(-OH) attributed to carbon dots, so carbon dots has successfully modified SBA-15. For CD-SBA15-CN materials, except characteristic band from SBA-15 and carbon dots, some strong bands are observed at 1241, 1322, 1406, 1571, and 1631 cm⁻¹ for the characteristic stretching modes of CN heterocycles and at 806 cm⁻¹ for the typical breathing mode of triazine units in g-C₃N₄,^{4,6} which further implying the successful loading of g-C₃N₄ into CD-SBA15. So the FTIR measurement can be further prove the g-C₃N₄ loading into carbon dots modified SBA-15.

- [1] Zhao D, Feng J, Huo Q, et al. *Sci*, 1998, **279**, 548-552.
- [2] J.R. Martinez, F. Ruiz, Y.R. Vorobiev, J.F. Perez-Robles, J. Gonzalez-Hernandez, *J. Chem. Phys.*, 1998, **109**, 7511.
- [3] F. Wang, Z. Xie, H. Zhang, C. Y. Liu, Y. G. Zhang, *Adv. Funct. Mater.*, 2011, **21**, 1027
- [4] L. Ge, F. Zuo, J. Liu, Q. Ma, C. Wang, D. Sun, L. Bartels, P. Feng, *J. Phys. Chem. C.*, 2012, **116**, 13708.
- [5] M. Shalom, S. Inal, D. Neher, M. Antonietti, *Catal. Today.*, 2014, **225**, 185.
- [6] Y. Kong, H.Y. Zhu, G. Yang, X.F. Guo, W.H. Hou, Q.J. Yan, M. Gu, C. Hu, *Adv. Funct. Mater.*, 2004, **14**, 816.