Supporting Information

Photodegradation of organic pollutants coupled with simultaneous photocatalytic evolution of hydrogen using quantum dot modified g-C_3N_4 catalysts under visible light irradiation

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This supporting information includes 9 pages and 14 figures.

Text S1.

FT-IR analyses

The five characteristic peaks at 810, 1245, 1324, 1458, and 1632 cm^{-1} can be found among the GCN nanosheets, which are attributed to the skeletal vibrations of tri-s-triazine ring (C_6N_7) units, whereas the signal at 1410 cm^{-1} originates from the stretching vibrations of the s-triazine ring (C_3N_3) units.[1] The absorption bands at 1638 cm^{-1} and 1245 cm^{-1} are attributed to the C=N and C-N stretching vibrational modes, respectively. The bands between 3200 cm^{-1} and 3500 cm^{-1} are ascribed to N-H and O-H stretches, associated with amino groups and surface absorbed H_2O molecules. But it cannot find the existence of CDs in the FT-IR spectra, mainly due to the C-C key peak position overlapping with the triazine ring position. The peaks at about 3000, 1600, and 1500 cm^{-1} correspond to the C=C stretching modes of polycyclic aromatic hydrocarbons.[2]

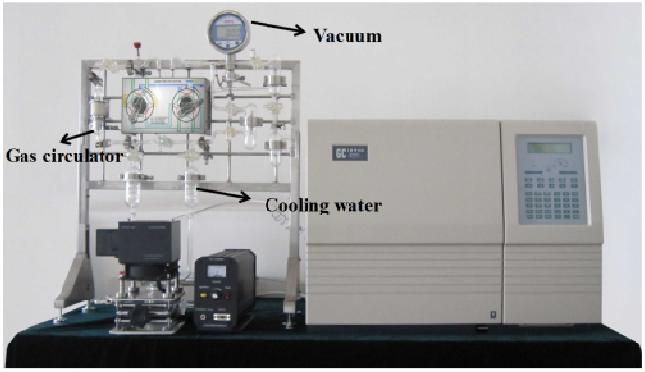

Fig. S1. Picture of photocatalytic reactor system.

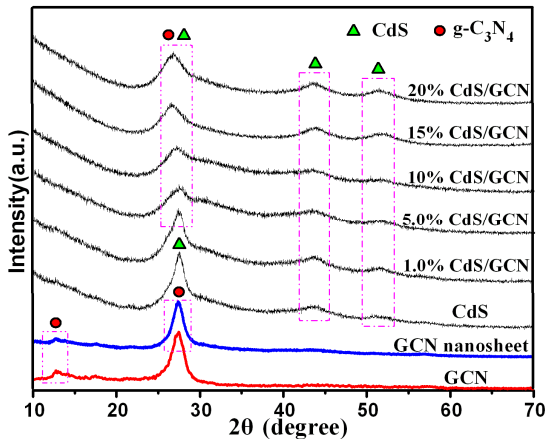

Fig. S2. XRD patterns of pure GCN, GCN nanosheets, CdS, and the CdS/GCN composite photocatalysts with different amount of CdS QDs.

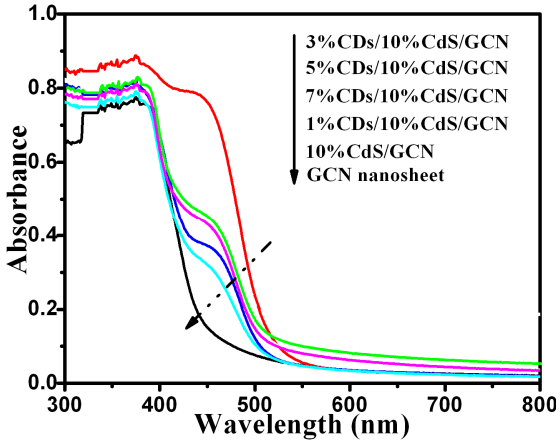

Fig. S3. DRS of GCN nanosheets and the 10%CdS/GCN loaded with different amount of CDs.

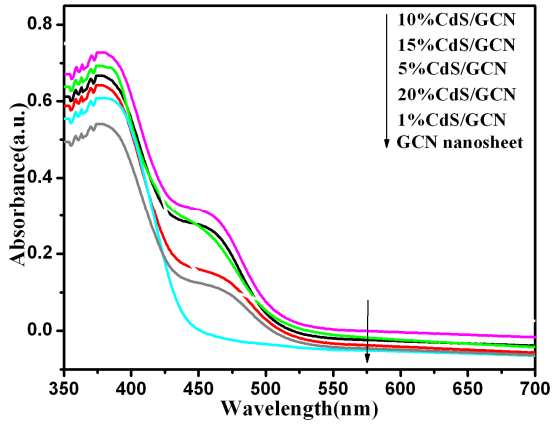

Fig. S4. DRS of GCN nanosheets loaded with different amount of CdS QDs.

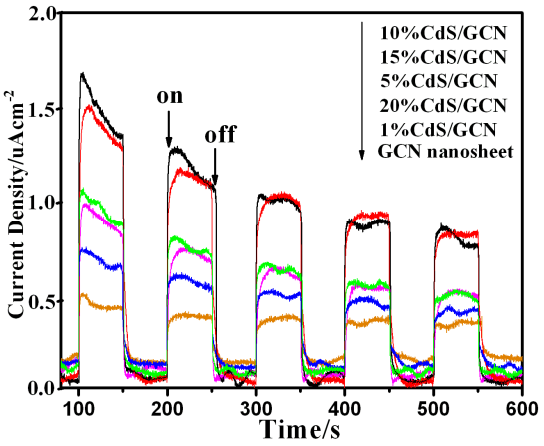

Fig. S5. Transient photocurrent response for the GCN nanosheets loaded with different amount of CdS QDs.

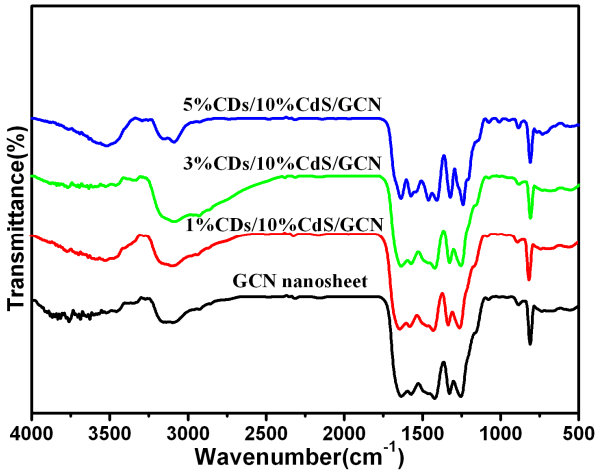

Fig. S6. FT-IR spectra of GCN naosheets and CDs/10%CdS/GCN composite catalysts with different amount of CDs.

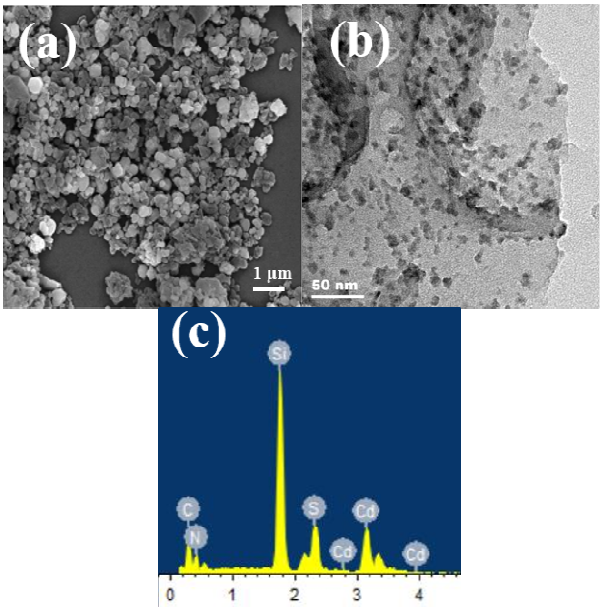

Fig. S7. (a) SEM, (b) TEM and (c) EDX images of the 3%CDs/10%CdS/GCN.

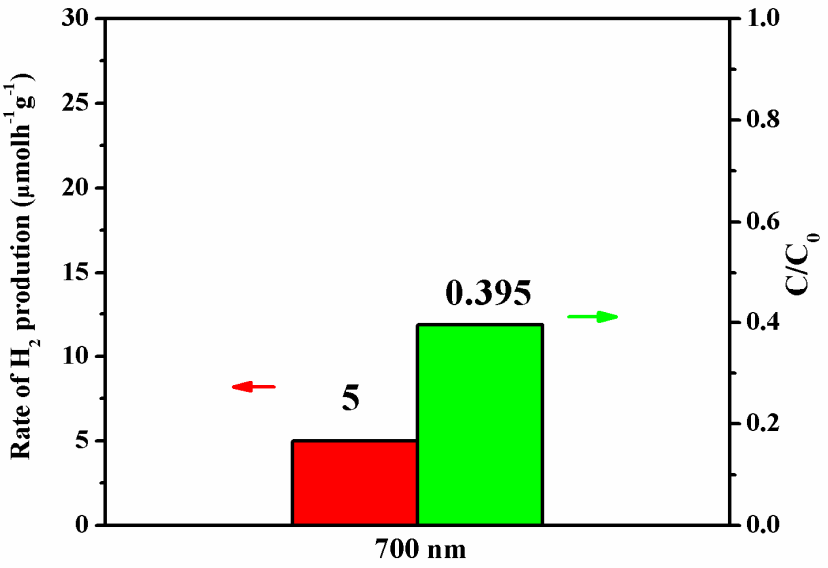

Fig. S8. Photocatalytic production of H_2 with simultaneous degradation of 4-NP over the 3%CDs/10%CdS/GCN under the light above 700 nm.

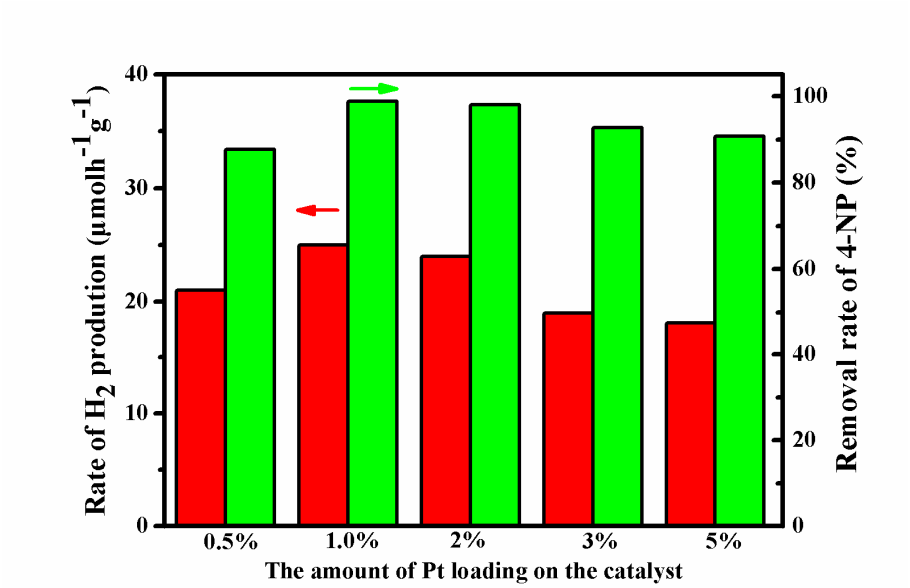

Fig. S9. Photocatalytic production of H_2 with simultaneous degradation of 4-NP over the 3%CDs/10%CdS/GCN with the different Pt loading amount under visible light irradiation.

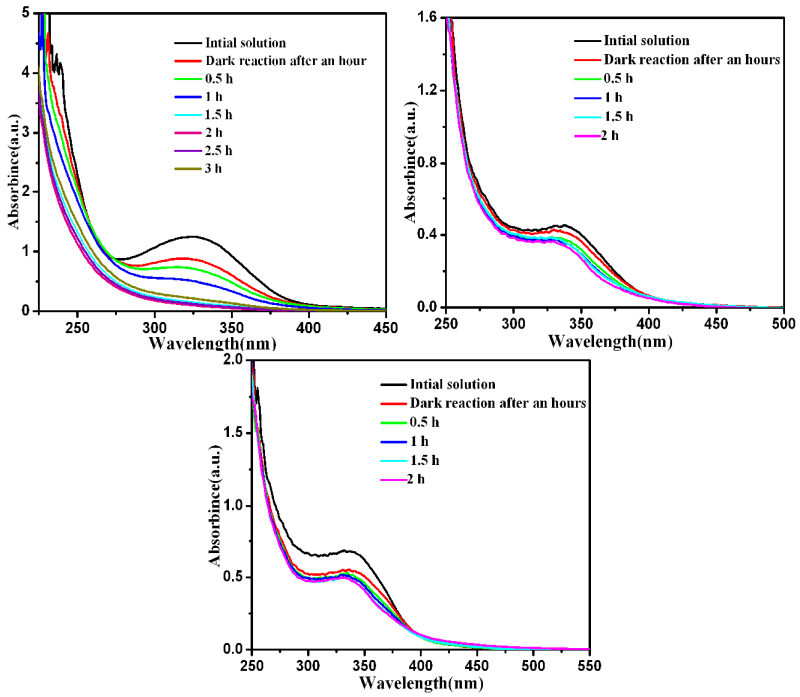

Fig. S10. Absorption spectra of p-nitrophenol, bisphenol A and tetracycline in the process of photodegradation of organic pollutants with simultaneous photocatalytic H_2 evolution over the 3%CDs/10%CdS/GCN under visible light irradiation.

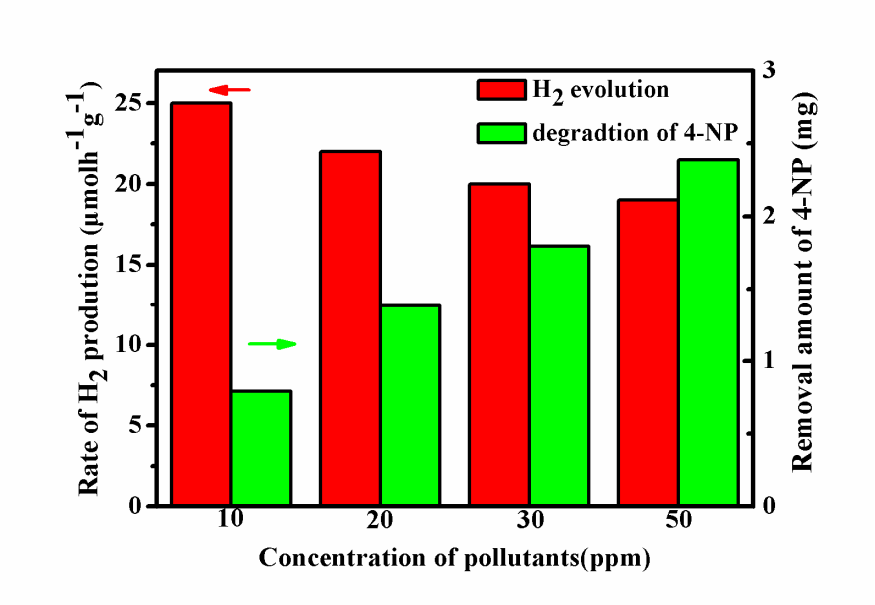

Fig. S11. Photocatalytic production of H_2 with simultaneous degradation of 4-NP over the 3%CDs/10%CdS/GCN at different initial concentration of 4-NP under visible light irradiation.

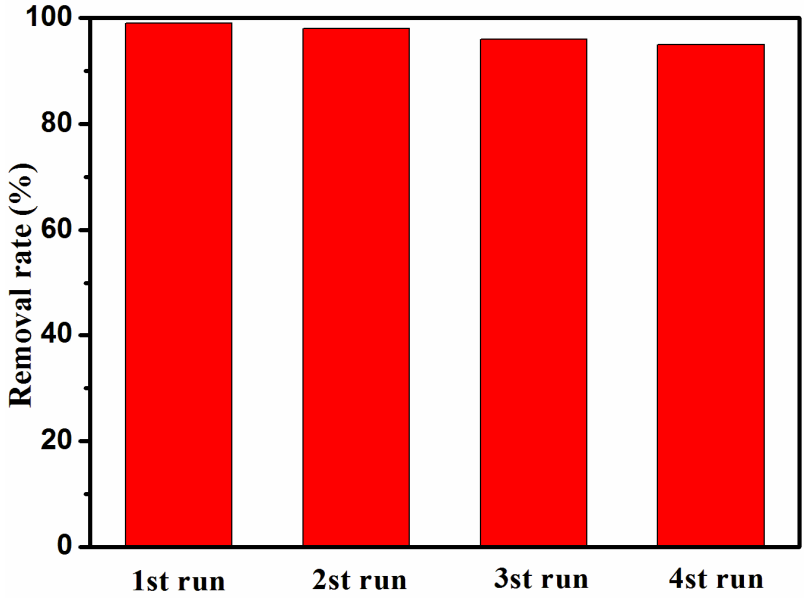

Fig. S12. Cycle runs of 4-NP degradation over the 3%CDs/10%CdS/GCN under visible light irradiation for 2h.

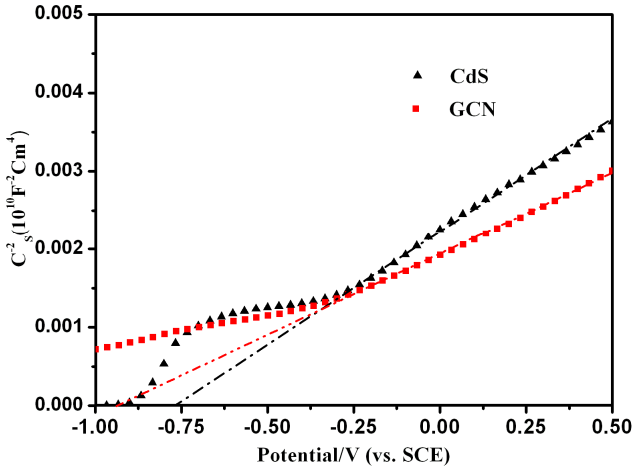

Fig. S13. Mott-Schottky polts of the GCN and CdS.

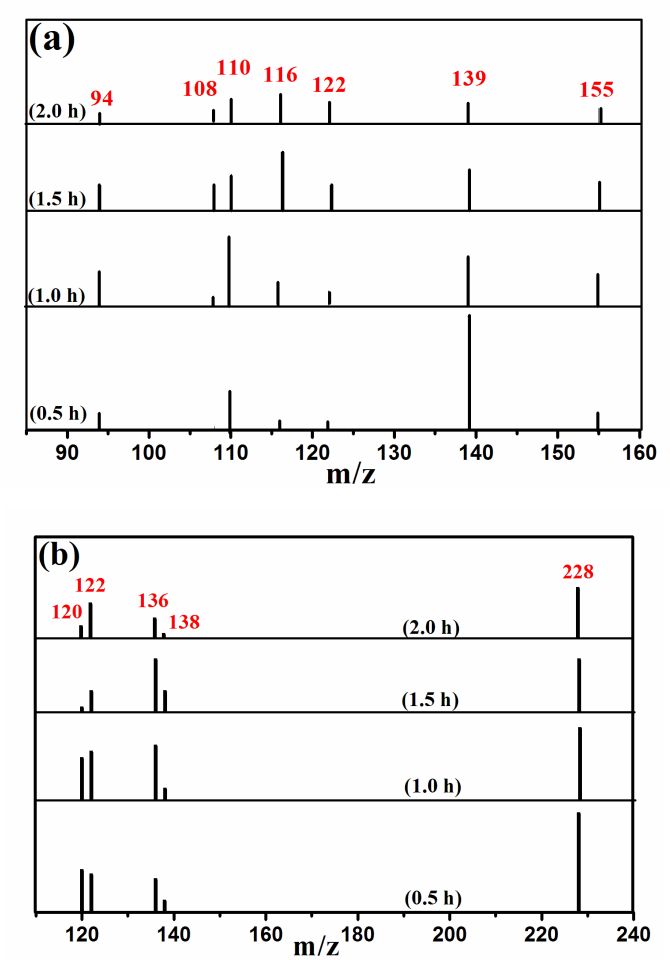

Fig. S14. (a) EIS spectra of 4-NP and (b) BPA at different photoreaction time over the 3%CDs/10%CdS/GCN under visible light irradiation.

References

(1) Cao, S.; Low, J.; Yu, J.; Jaroniec, M. Polymeric photocatalysts based on graphitic carbon nitride. *Adv. Mater.* **2015,** *27* (13), 2150-2176, DOI: 10.1002/adma.201500033.

(2) Yu, H.; Shi, R.; Zhao, Y.; Waterhouse, G. I.; Wu, L. Z.; Tung, C. H.; Zhang, T. Smart utilization of carbon dots in semiconductor photocatalysis. *Adv. Mater.* **2016,** *28* (43), 9454-9477, DOI: 10.1002/adma.201602581.