# Electrostatic Self-Assembled Synthesis of Amorphous/ Crystalline g-$C_3N_4$ Homo-Junction for Efficient Photocatalytic $H_2$ Production with Simultaneous Antibiotic Degradation

**Yilin Pan [1], Kai Qiao [1], Chuangyu Ning [2], Xin Wang [2,3,4], Zhiquan Liu [1,*] and Zhihong Chen [1,*]**

[1] Key Laboratory for Water Quality and Conservation of the Pearl River Delta, Guangzhou University, Guangzhou 511370, China
[2] International Academy of Optoelectronics at Zhaoqing, South China Normal University, Liyuan Street, Zhaoqing 526238, China; wangxin@scnu.edu.cn (X.W.)
[3] Institute of Carbon Neutrality, Zhejiang Wanli University, Ningbo 315100, China
[4] National Center for International Research on Green Optoelectronics, South China Academy of Advanced Optoelectronics, South China Normal University, Guangzhou 510006, China
* Correspondence: zhiquanliu@gzhu.edu.cn (Z.L.); chenzhihong@gzhu.edu.cn (Z.C.)

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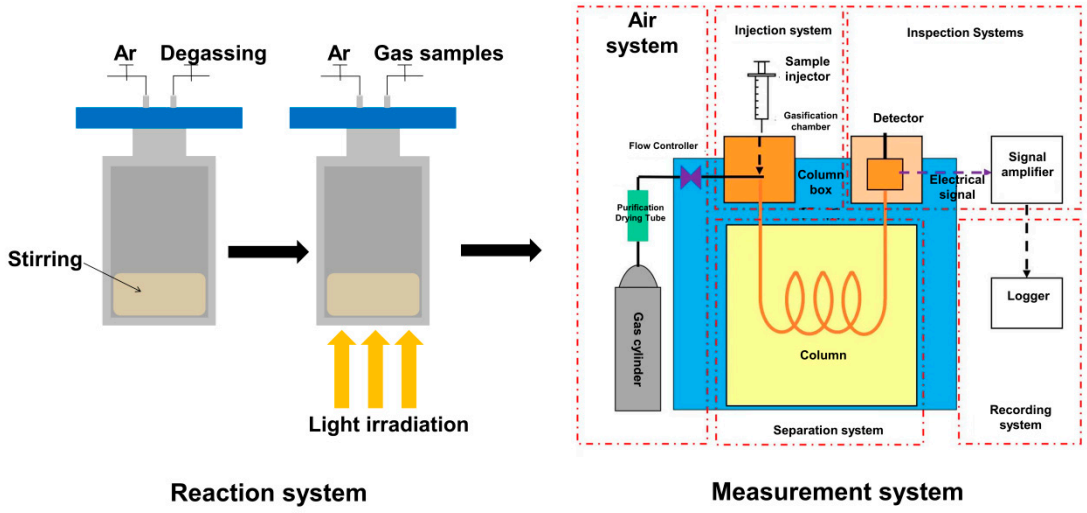
**Table S1.** Application of g-$C_3N_4$-based photocatalysts in photocatalytic $H_2$ production.

| Photocatalyst | Preparation | Light source | Solution Systems | Hydrogen evolution /pollutants degradation rate | Ref |
|---|---|---|---|---|---|
| GQDs/TCN | Calcination | 300 W Xe (320 nm ≤ λ ≤ 780 nm) | 10 ppm CIP | 1μmol/g·h / 70% | [45] |
| C/N-$TiO_2$@$C_3N_4$NTs | Pyrolysis | 300 W Xe (λ ≥ 420 nm) | 20ppm RhB | 9.67μmol/g·h / 70% | [46] |
| Ag/g-$C_3N_4$-Ag-$Ag_3PO_4$ | Photoassisted isoelectric point | 300 W Xe | 10ppm LEV | 55.41μmol/g·h / 90% | [16] |
| Pt@g-$C_3N_4$ nanorod | Calcination | 300 W Xe (λ ≥ 420 nm) | 10ppm 2,4-DNP | 96μmol/g·h / 100% | [47] |
| CDs/CdS/gCN | Hydrothermal | 300 W Xe (λ ≥ 420 nm) | 10 ppm BPA | 130μmol/g·h / 70% | [48] |
| 2D BP/2D $C_3N_4$ | Liquid-phase exfoliation | 300 W Xe (λ > 400 nm) | 10 ppm BPA | 259μmol/g·h / 88% | [11] |
| g-$C_3N_4$ nanotubes | Hydrothermal-calcination | 300 W Xe (λ > 400 nm) | 10 ppm BPA | 272.6μmol/g·h / 92% | [49] |
| g-$C_3N_4$ (oyster shell) | Single-step biomediated | 125W Hg lamp （λ> 400 nm） | 10 vol% TEOA | 87 μmol/g·h | [50] |
| Re-CNN/CNN/Ox-CNN | Calcination | 300W Xe（λ> 420 nm） | 10 vol% TEOA | 127.05μmol/g·h | [51] |
| UDCN-30 | Calcination | 150W Xe（λ> 420 nm） | 10 vol% TEOA | 190μmol/g·h | [18] |
| O-doped g-$C_3N_4$ | One step template | 300 W Xe（λ< 460 nm） | 20 vol%TEOA | 203.66 μmol/h | [52] |
| ACN/CCN | Electrostatic self-assembly | 300 W Xe（AM1.5） | 500 ppm CIP | 162.5 μmol/h / 12.6% | This work |




**Scheme S1.** Hydrogen measurement system schematic.

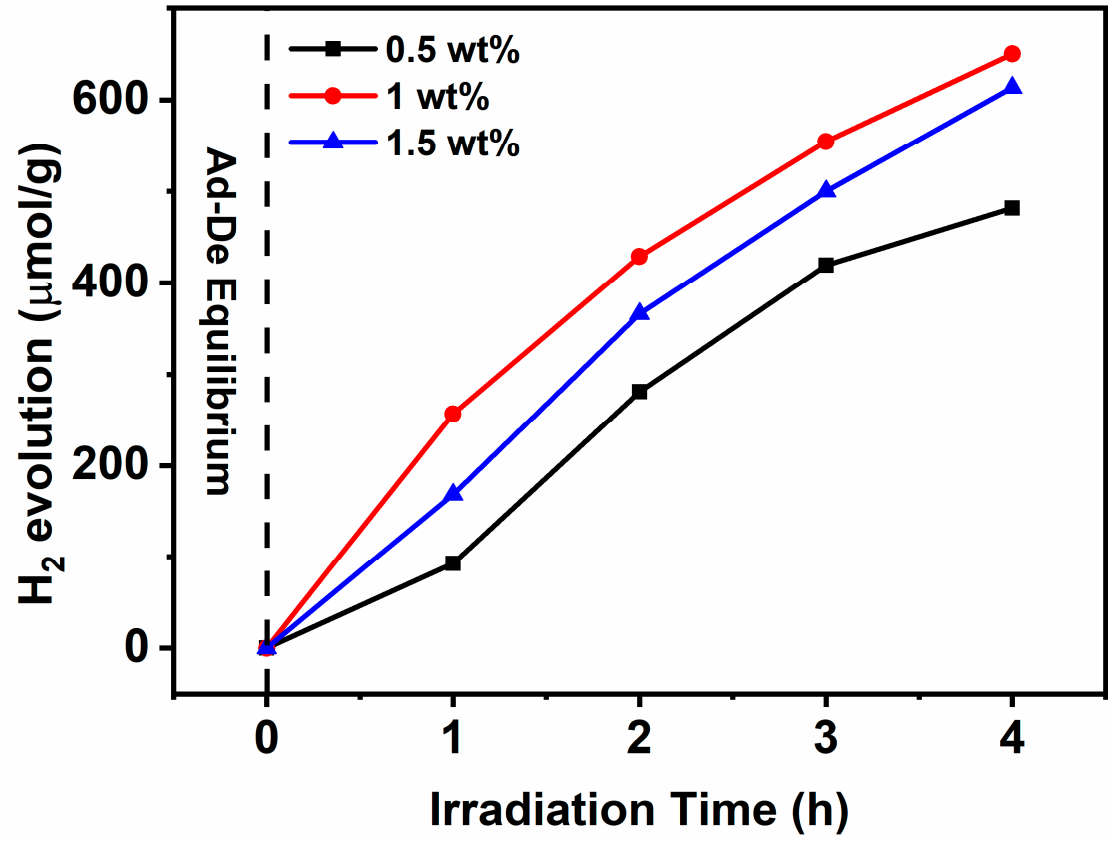



**Figure S1.** The ACN/CCN-2 photocatalytic $H_2$ production at different dosages of Pt.

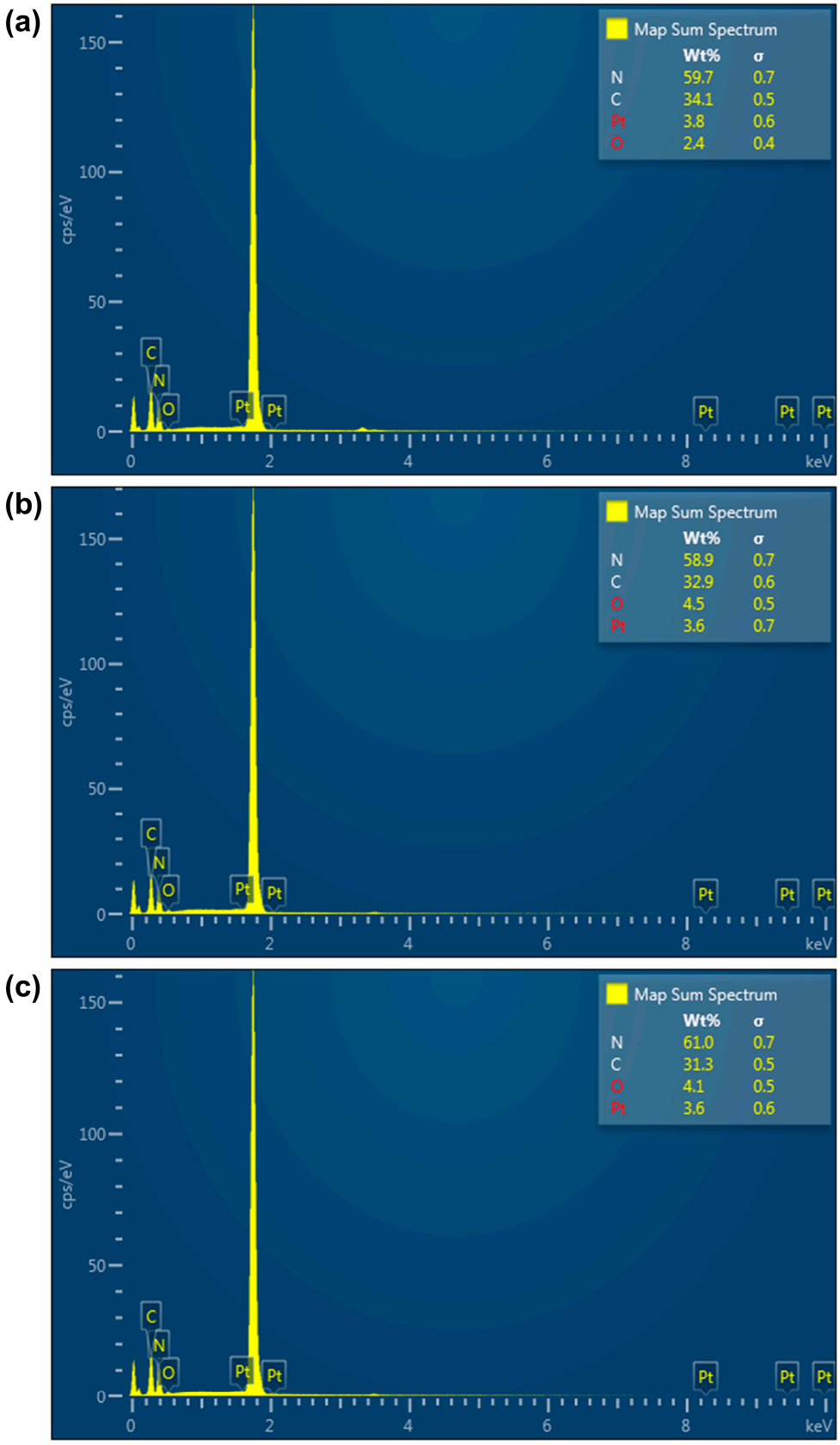
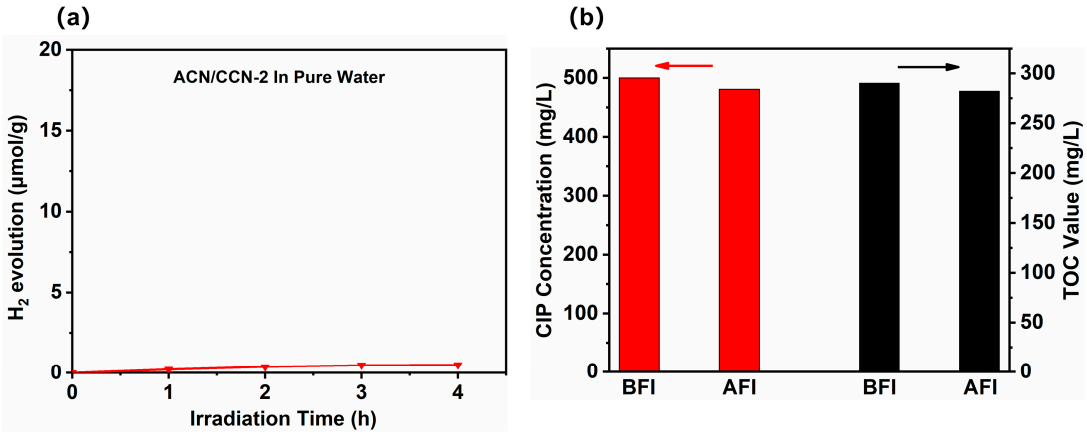



**Figure S2.** The doping amount of Pt after the reacation of ACN (a), CCN (b), ACN/CCN-2 (c).




BFI = Before irradiation, AFI = After irradiation

**Figure S3.** (a) The photocatalytic $H_2$ evolution performance of ACN/CCN-2 in pure water and (b) TOC removal of CIP in the photocatalytic reaction.

**Calculation of $CO_2$ selectivity**

BCIP : CIP concentration before irradiation

ACIP : CIP concentration after irradiation

BTOC : TOC value before irradiation

ATOC : TOC value after irradiation

TTOC : Theoretical TOC value after irradiation = $\frac{ACIP \times BTOC}{BCIP}$

$CO_2$ selectivity = $\frac{BTOC-ATOC}{BTOC-TTOC} \times 100\%$

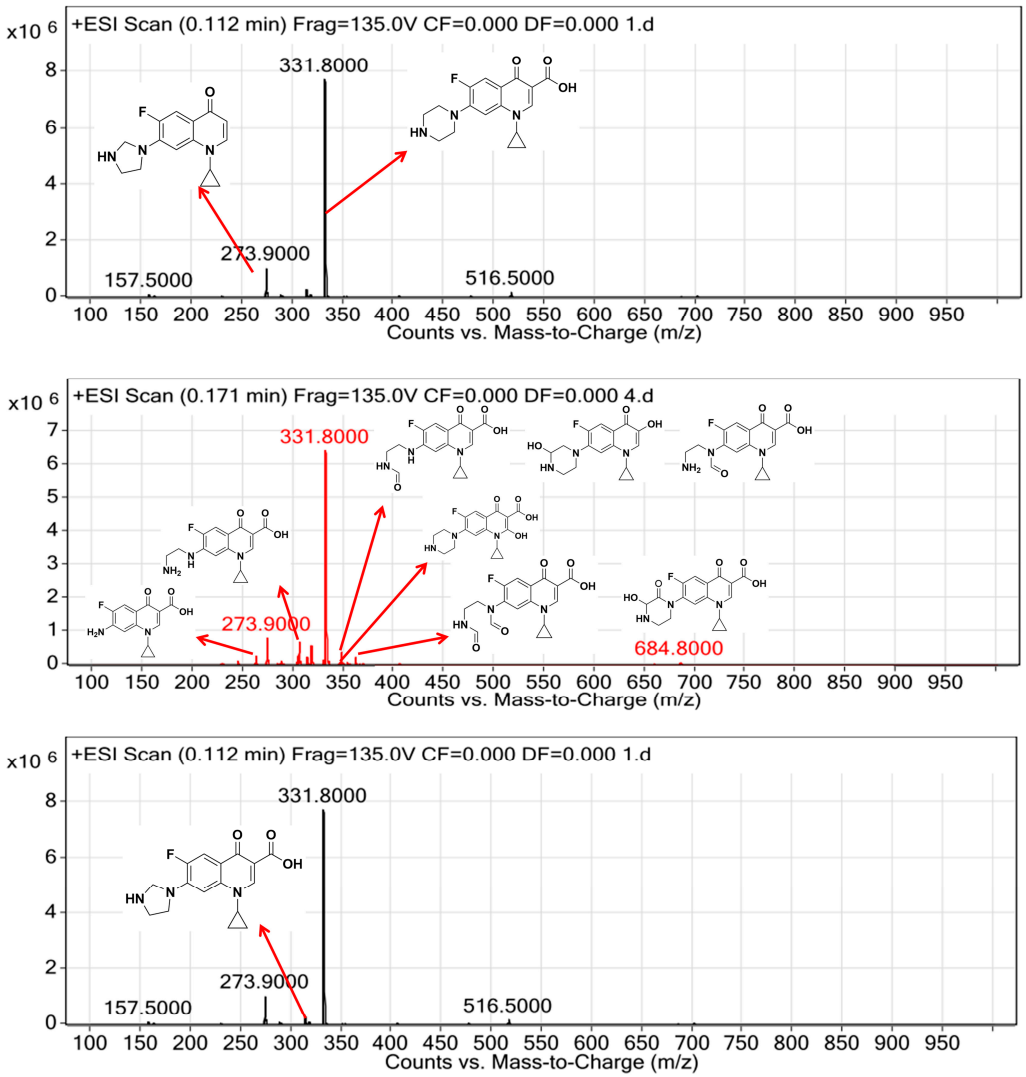
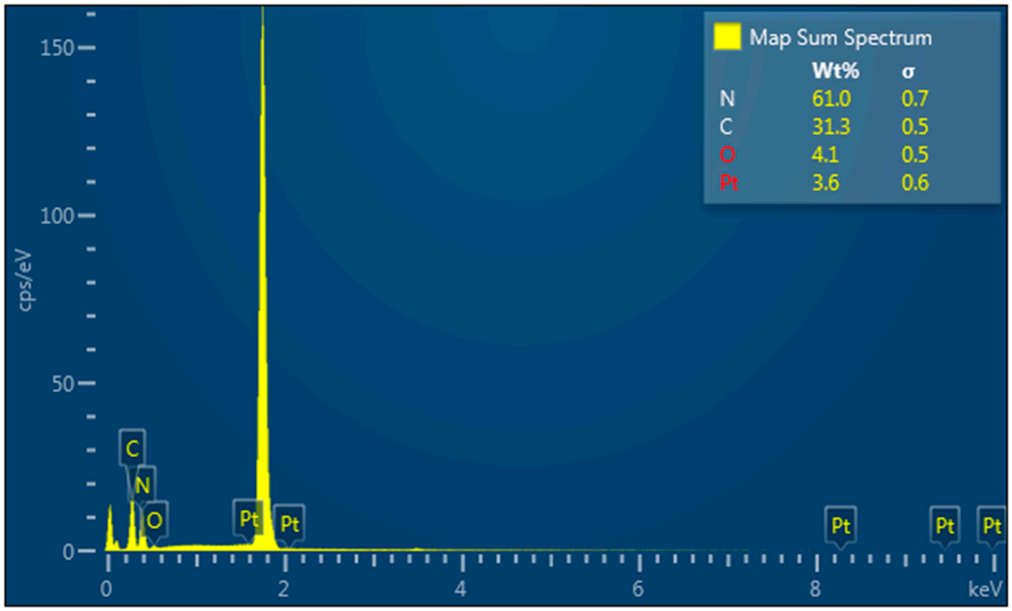



**Figure S4.** The HPLC-MS identical intermediates of the degradation of CIP with ACN/CCN-2 under visible light irradiation.

(a)




(b)

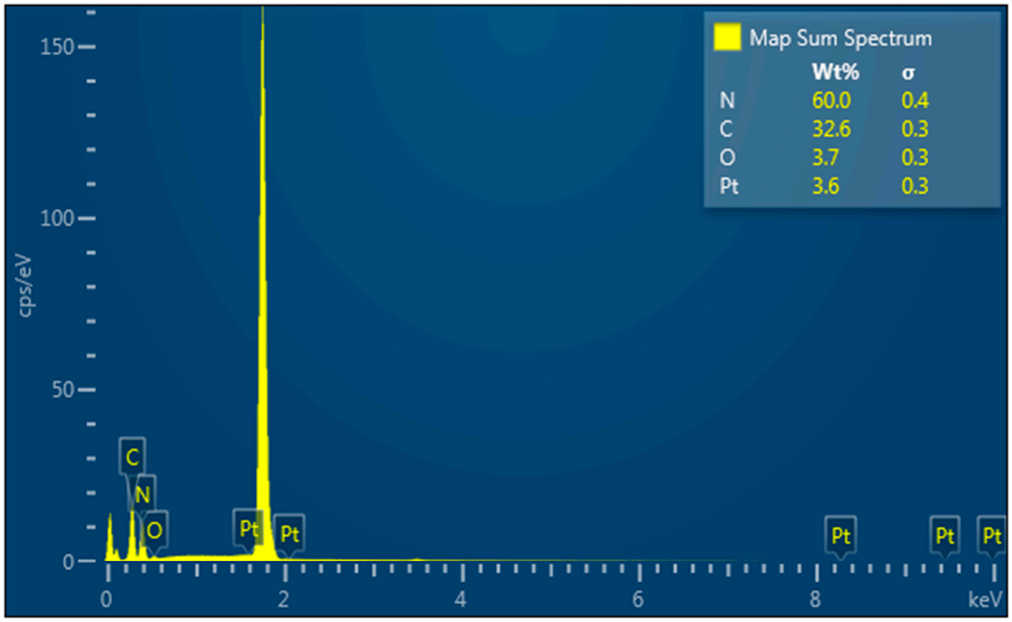



**Figure S5.** The Pt conten on the ACN/CCN-2 1st run (a) and 2nd run (b).