

Supporting Information (7 figures):

Structure defects in g-C₃N₄ limit visible light driven hydrogen evolution and photovoltage

Po Wu,^{a,b} Jiarui Wang,^b Jing Zhao,^b Liejin Guo,^{*a} and Frank E. Osterloh,^{*b}

^a International Research Center for Renewable Energy, State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, No. 28 West Xianning Road, Xi'an, Shaanxi, 710049, P.R.China. Tel:(+86)02982663895; Fax: (+86)02982669033; E-mail: lj-guo@mail.xjtu.edu.cn.

^b Department of Chemistry, University of California, Davis. One Shields Avenue, Davis, CA, 95616, USA. Tel: (+1)5307546242; E-mail: fosterloh@ucdavis.edu

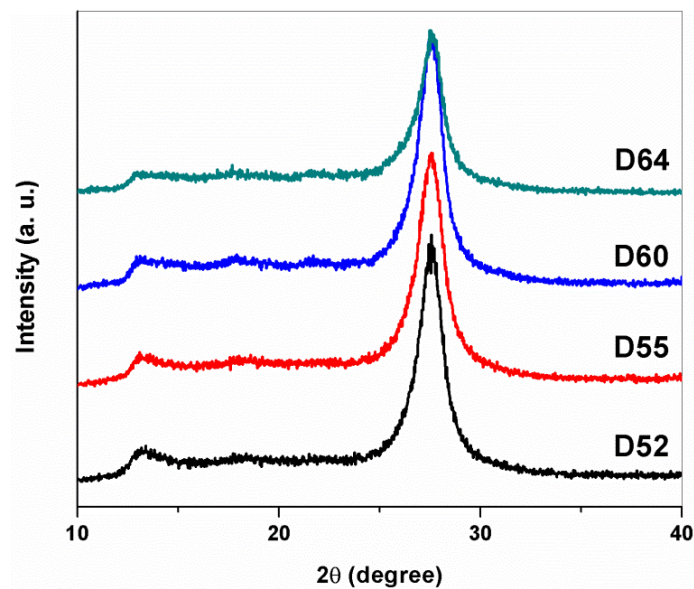


Figure S1. Powder XRD patterns of as-synthesized samples D52, D55, D60 and D64.

The powder X-ray diffraction (XRD) patterns confirmed the successful formation of g-C₃N₄ (space group: P6₃/mmc). Two typical peaks of g-C₃N₄ are observed for all the prepared samples. The intense peak at around 27.5° is indexed as the (002) diffraction, corresponding to the interlayer stacking of graphite-like segments with a distance of 0.325 nm. The weaker peak at around 13.1° ($d = 0.675$ nm) is assigned to the (100) diffraction of in-plane structural periods of tri-s-triazine unit.¹

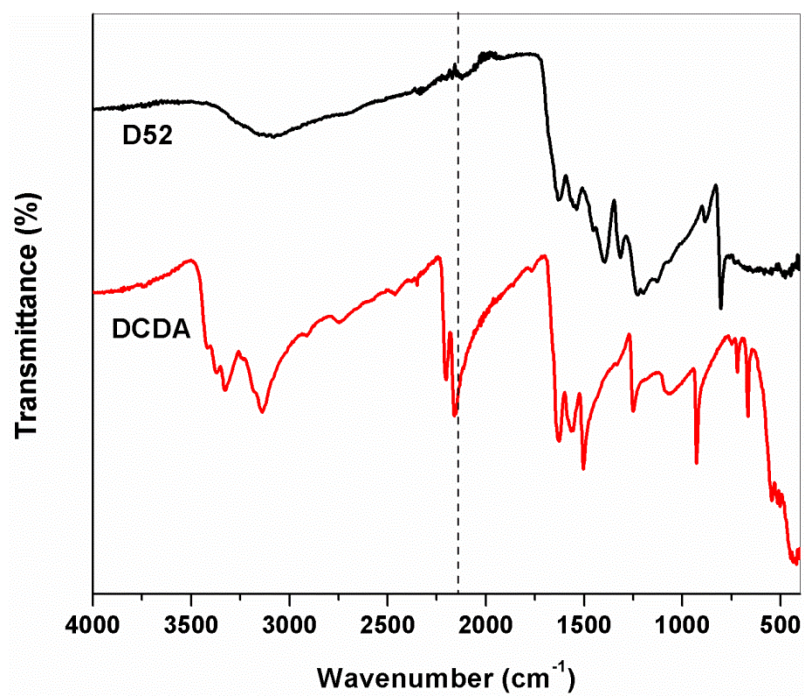


Figure S2. FTIR spectra of DCDA and D52. Dashed line indicates the common peak position.

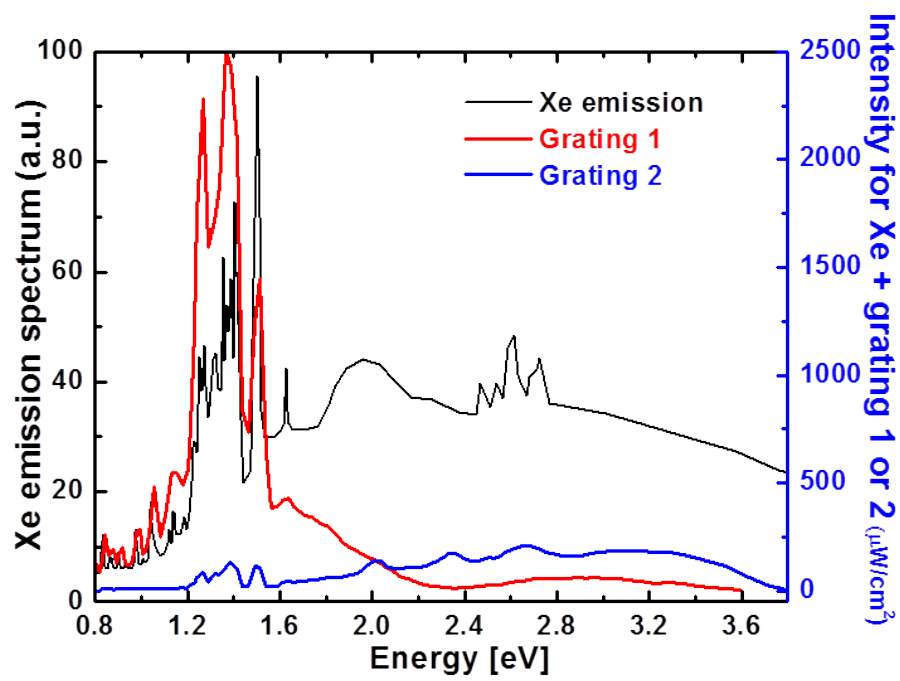


Figure S3. Spectral output of Xe lamp / monochromator configuration as measured by thermopile detector. Grating 2 was used for the SPV measurements.

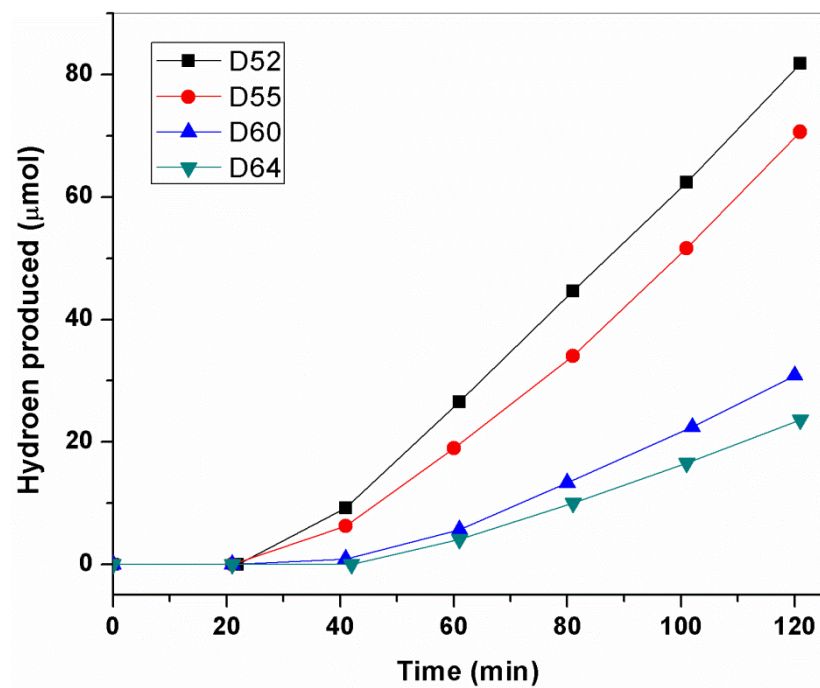


Figure S4. H₂ evolution from samples (30 mg) in methanol (20 vol. %) aqueous solution at pH = 4.5 under full spectrum irradiation of Xe lamp, as the Pt photodeposition process.

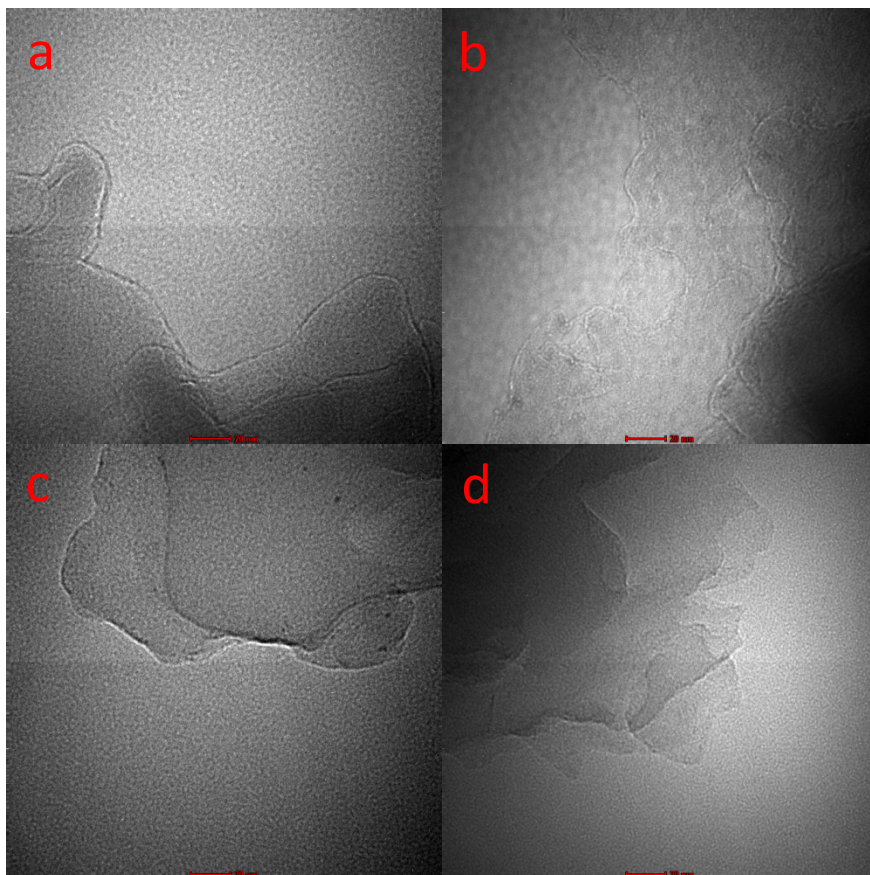


Figure S5. TEM images of (a) D52, (b) D55, (c) D60 and (d) D64. All the scale bars are 20 nm.

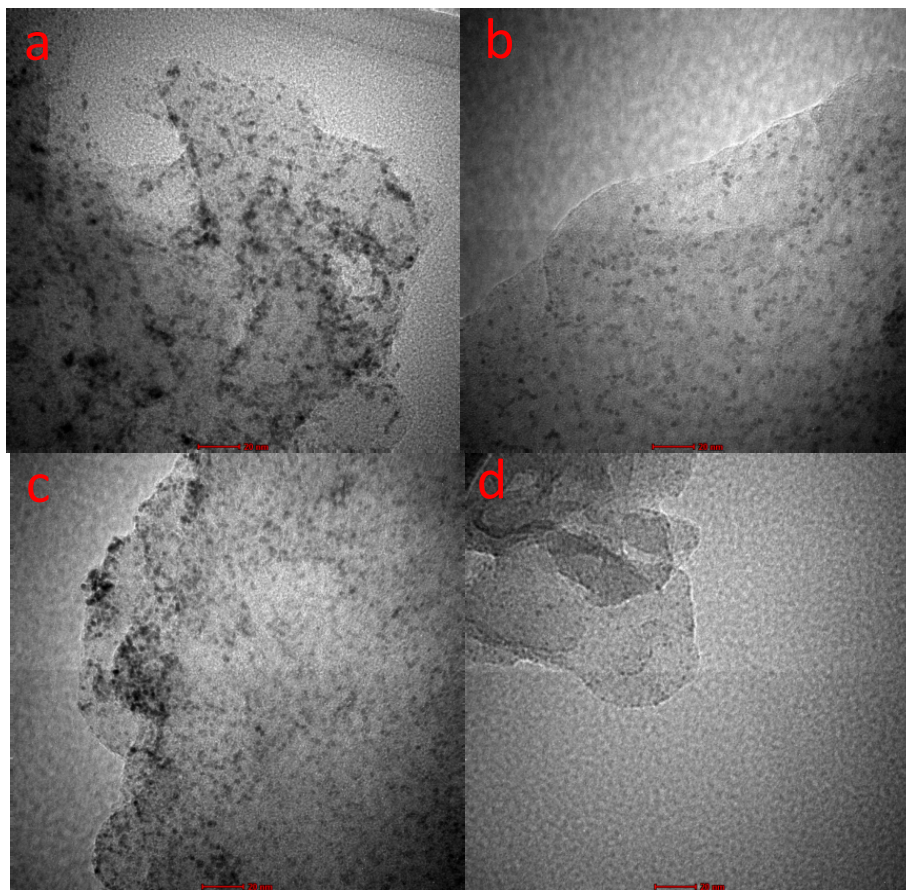


Figure S6. TEM images of samples: (a) D52, (b) D55, (c) D60 and (d) D64 after photodeposition of Pt nanoparticles. All the scale bars are 20 nm.

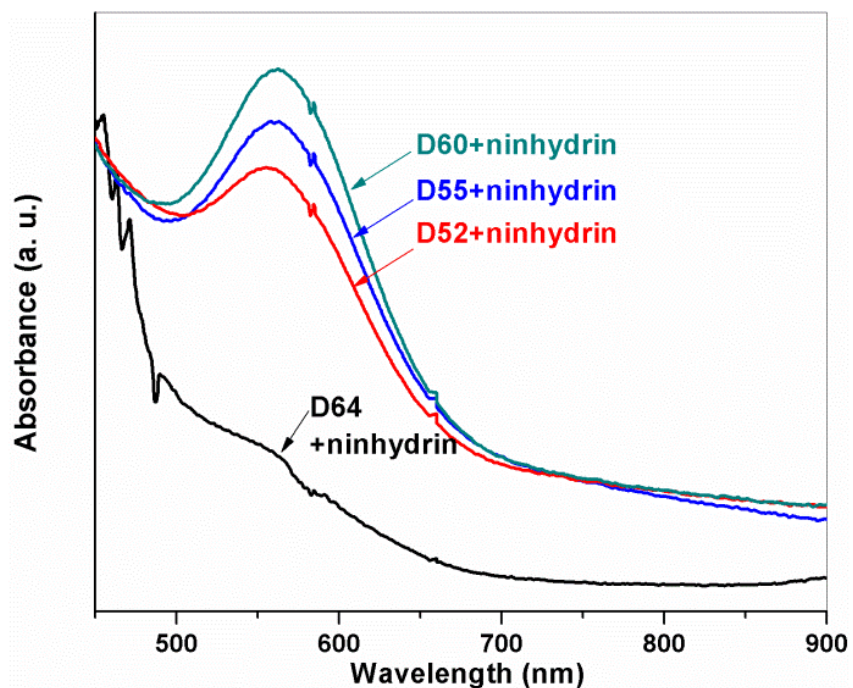


Figure S7. Optical absorption spectra of the solutions from the “ninhydrin tests” over different samples based on the same procedure.

Experimental details: The ninhydrin test was performed by adding 1 mL ninhydrin acetone solution (80mg/mL) into 2mL g-C₃N₄ suspension (2mg g-C₃N₄), and then heating the covered mixture in boiling water bath for 15 minutes. The UV-Vs absorption spectra were measured with a UV-Vis spectrometer (Ocean Optics Inc.: HR2000CG-UV-NIR), directly using the solution after heating.

References:

1. J. Chen, S. Shen, P. Guo, P. Wu and L. Guo, *J. Mater. Chem. A*, 2014, **2**, 4605-4612.