

**Dispersed Conductive Polymer Nanoparticles on Graphitic Carbon Nitride for  
Enhanced Solar-driven Hydrogen Evolution from Pure Water**

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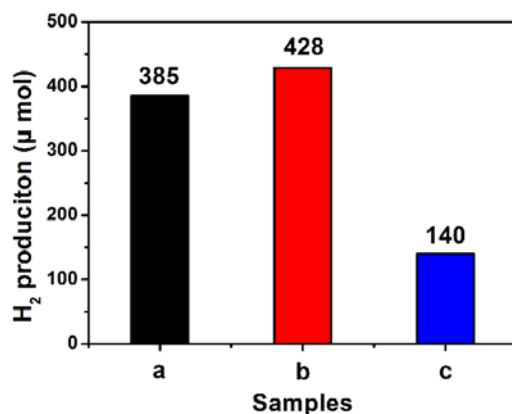
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**The method to test the concentration of hydrogen peroxide produced at the interface of g-C<sub>3</sub>N<sub>4</sub> and water under simulated solar light:**

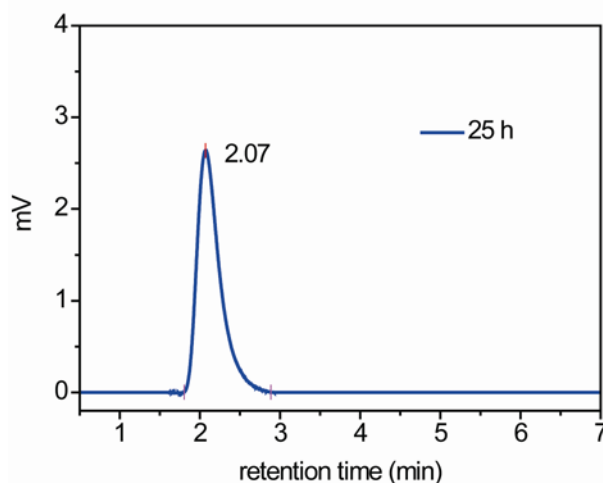
Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) measurements were performed on 2.0 mL reaction suspension that was taken immediately after the irradiation. For each test, a 0.5 mL volume of 1% *o*-tolidine in 0.1 M HCl (Alfa Aesar, 98%, without further purification)<sup>[1]</sup> was added to the suspension. This mixture was allowed to react for 2 min. In the presence of peroxides, a blue color is formed very quickly resulting from the oxidation of *o*-tolidine. Subsequently, the dispersion was acidified with 1 M HCl (2 mL), which caused the color of the dispersion to turn yellow. The yellow-coloured species is the protonated form of the 2-electron oxidation product of *o*-tolidine formed. The dispersion was quickly filtered through a 0.22 μm membrane filter and the absorption spectrum of the filtrate was immediately recorded with a UV-Vis spectrophotometer (Shimadzu, UV-2550). The absorption spectrum of the 2-electron oxidized toluidine has a characteristic maximum at 438 nm.

**Concentration of peroxides determined by the calibrated curve and fitting equation**

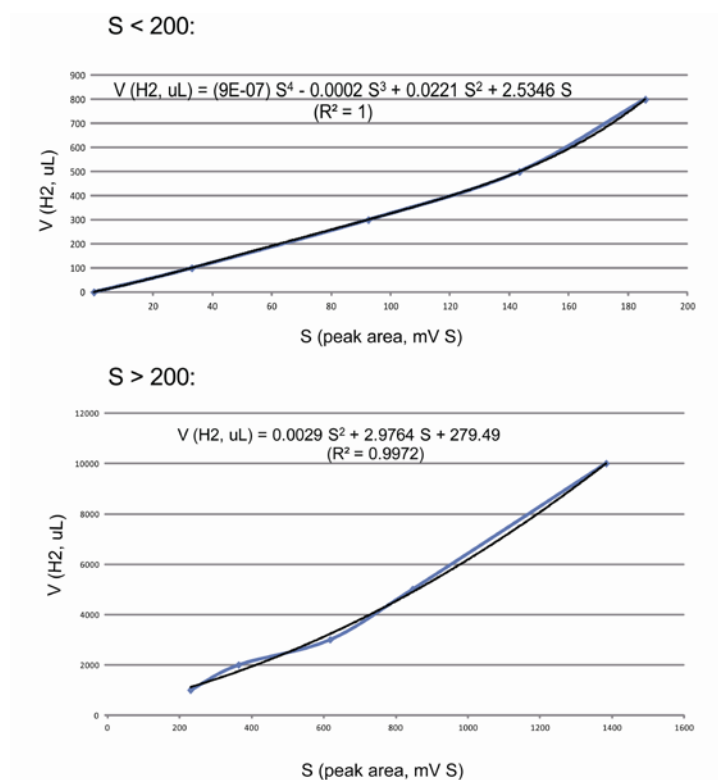
The calibrated curve and fitting equation was made using H<sub>2</sub>O<sub>2</sub> with different concentration as external standard materials. The *o*-tolidine as an indicator for H<sub>2</sub>O<sub>2</sub> was the quick oxidation reaction of *o*-tolidine and H<sub>2</sub>O<sub>2</sub> catalyzed by Pt<sup>[2,3]</sup>. Without the catalyst, the colorization reaction was slow. Therefore, we used Pt-g-C<sub>3</sub>N<sub>4</sub> without irradiation as the catalyst for the indicator reaction. The testing process was similar to the mentioned above, but the reaction suspension was 1 mL H<sub>2</sub>O<sub>2</sub> solution and 1 mL Pt-g-C<sub>3</sub>N<sub>4</sub> (0.8 mg mL<sup>-1</sup>).



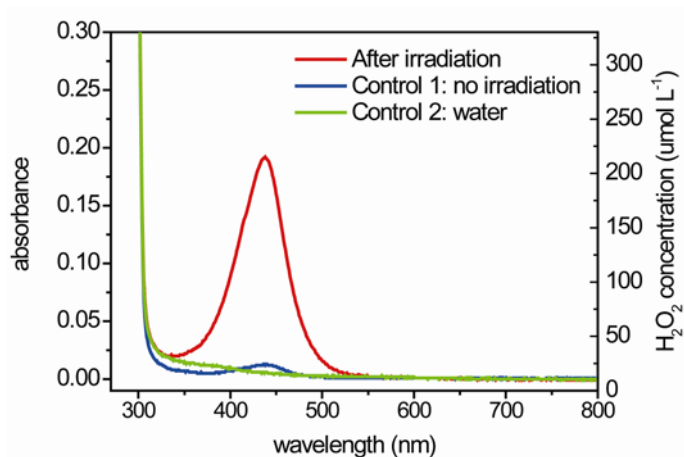
**Fig. S1** The H<sub>2</sub> evolution for Pt loaded PC1.5 (PPy/g-C<sub>3</sub>N<sub>4</sub> with PPy loading amount of 1.5 wt%) with different sacrificial electrons donors. (a) Pure water. (b) 10 v% triethanolamine (TEA). (c) 0.25 M Na<sub>2</sub>S/Na<sub>2</sub>SO<sub>3</sub>.



**Fig. S2** The detected evolving gas by Gas Chromatogram (TCD as detector, packed column, molecular sieve 5A 60-80 mesh, column serial number 100526-01) with N<sub>2</sub> as carrier gas.

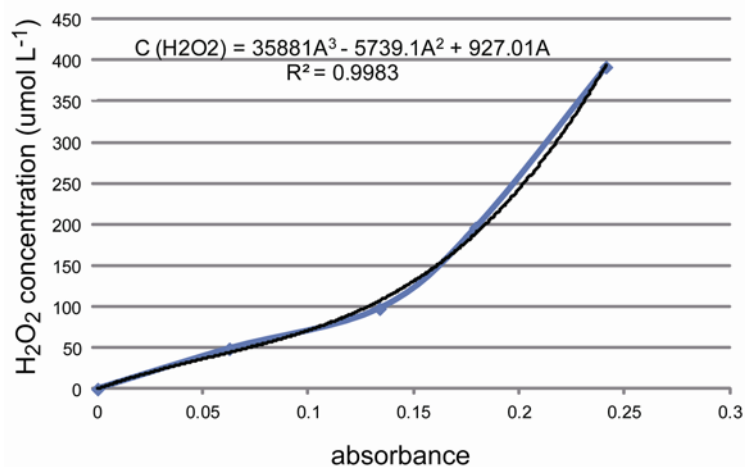


**Fig. S3** The calibration curve and fitting equation of produced H<sub>2</sub> and the peak area obtained from GC test, which are determined by external standard method using H<sub>2</sub> (99.999%) as standard materials with different volume under the same experimental and GC conditions as the water-splitting experiment.



**Fig. S4** The hydrogen peroxide produced on the interface of g-C<sub>3</sub>N<sub>4</sub> and water under solar light irradiation. Control 1: Pt-g-C<sub>3</sub>N<sub>4</sub> without irradiation. Control 2: water instead of Pt-g-C<sub>3</sub>N<sub>4</sub>. Simulated solar light was obtained by an AM1.5 filter with an intensity of 56.07 mW cm<sup>-2</sup>. The reaction system was 80 mg photocatalyst in 100 mL

water.



**Fig. S5** The calibration curve and the fitting equation of the H<sub>2</sub>O<sub>2</sub> concentration and absorbance, which are determined by external standard method using H<sub>2</sub>O<sub>2</sub> as standard materials with different concentration under the same experimental conditions.

**References:**

- [1] O. C. Compton, F. E. Osterloh, *J. Phys. Chem. C* 2009, **113**, 479-485.
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- [3] J. Kiwi, M. Gratzel, *J. Mol. Cat.*, 1987, 39, 63-70.