Supporting information

Sulfidization of platinum nickel bimetal decorated g-C_3N_4 for photocatalytic hydrogen production： photogenerated charge behavior study

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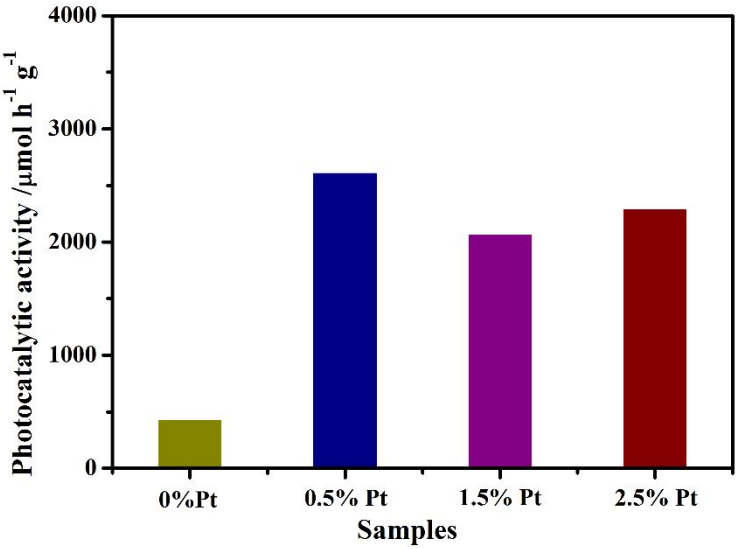

Figure S1. Comparison of the photocatalytic H_2 production activity of $PtNi_x/g\text{-}C_3N_4$ modified with different mass percent of Pt, using triethanolamine as the scavenger under a 300 W Xe lamp (as the light source) irradiation.

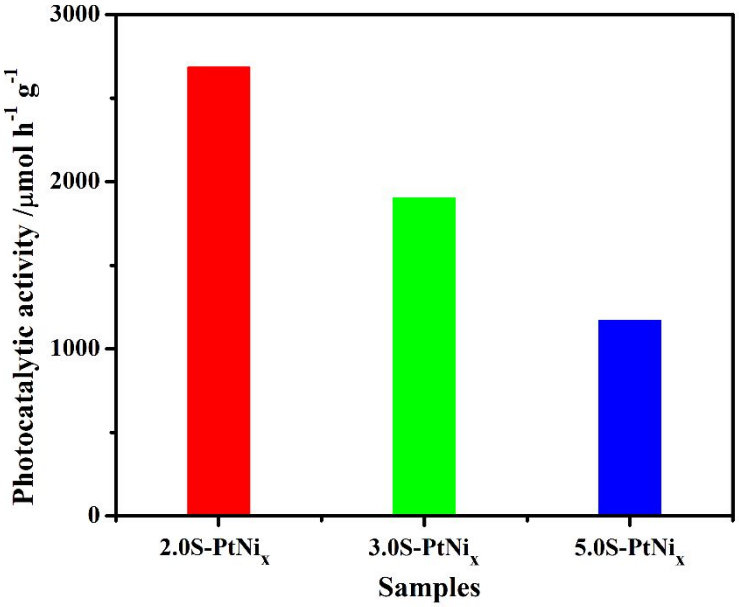

Figure S2. Comparison of the photocatalytic H_2 production activity of $PtNi_x/g\text{-}C_3N_4$ composites modified with different content of thiourea, using triethanolamine as the scavenger under a 300 W Xe lamp (as the light source) irradiation.

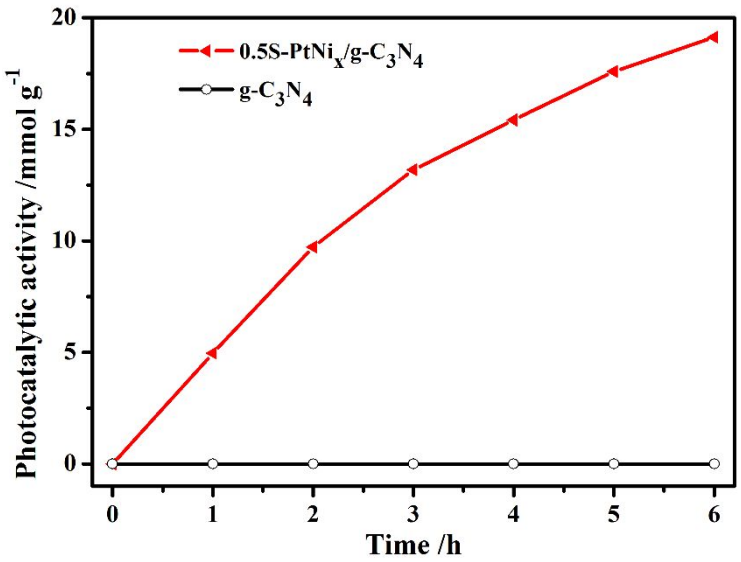

Figure S3. The photocatalytic hydrogen rate of 0.5S-PtNi$_x$/g-C$_3$N$_4$ and g-C$_3$N$_4$ photocatalysts for 6 h, using triethanolamine as the scavenger under a 300 W Xe lamp (as the light source) irradiation.

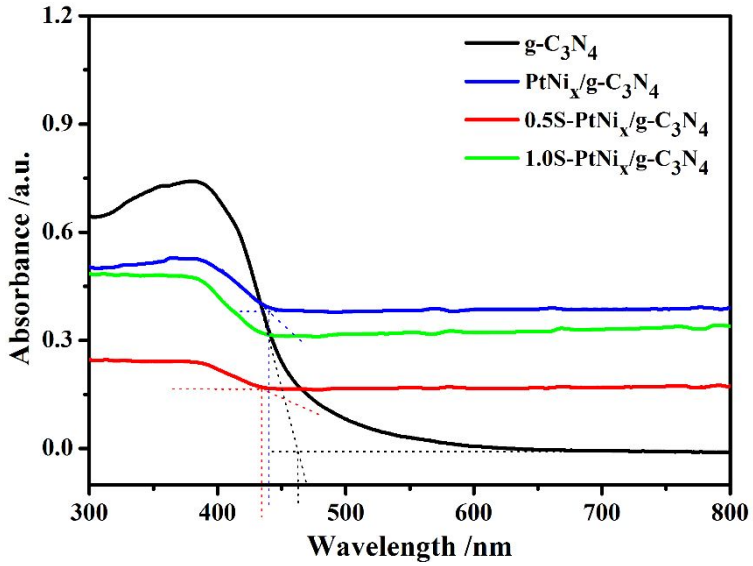

Figure S4. UV/Vis absorption spectra of bare g-C$_3$N$_4$, PtNi$_x$/g-C$_3$N$_4$ and PtNi$_x$/g-C$_3$N$_4$ composites modified with different content of thiourea.

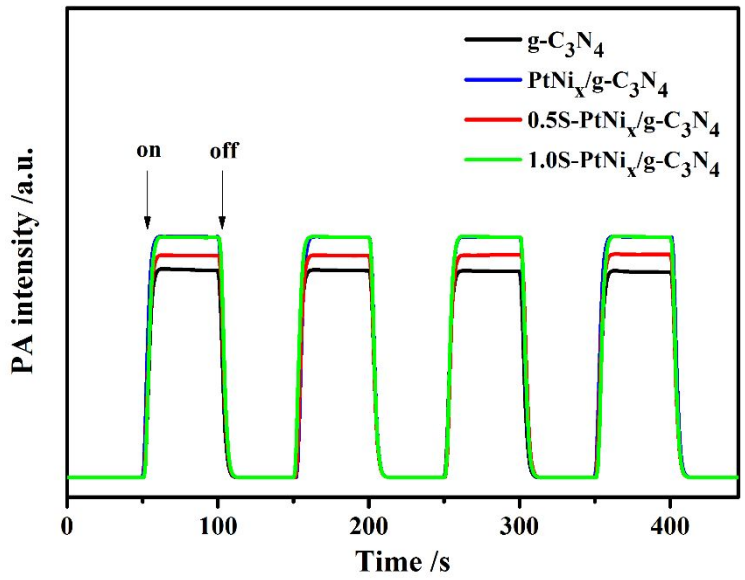

Figure S5. Photoacoustic response of pure g-C_3N_4, $PtNi_x$/g-C_3N_4 and $PtNi_x$/g-C_3N_4 composites modified with different content of thiourea under 405 nm laser irradiation with a bias voltage of 10 V.

The apparent quantum yield (AQY)

The apparent quantum yield was measured by a 500 W gallium lodine lamp, and UV−Visible spectrophotometry (Shimadzu UV-3600) was used to measure the number of photons of the light source at 365 nm. Typically, we prepared 100 mL (0.01 M) $K_3Fe(C_2O_4)_3.3H_2O$ solution (V_0) and placed in photocatalytic reactor under stirring, and then the solution was irradiated for 60 s, 5 mL samples (V_1) were taken and added into a 50 mL brown volumetric flask; then 10 mL of (0.01 M) 1,10- Phenanthroline monohydrate solution and 10 mL of acetic acid-sodium acetate buffer solution (pH 5.0) were added, then diluted to 50 mL (V_2), and placed flask for 30 min in the dark. Three parallel samples of each samples were taken for measuring, and the absorbance was measured at 510 nm (A_t). Finally, the CTE was calculated by the Eq1-1 and Eq1-2:

$$\Phi_{H2}=2nN/n' \times 100\% \quad (1\text{-}1)$$

Where n is the amount of hydrogen generated in t time (mol/3600 s), which is measured under the same condition of 500 W gallium lodine lamp; N means Avogadro's constant; n′ is the number of light source emitted photon in per unit time (s^{-1}).

$$n' = (A_t - A_0)N_0V_0V_2/\varepsilon LV_1\,\Phi_{Fe}^{2+}t \quad (1\text{-}2)$$

Where A_0 is the absorbance of zero irradiation time; ε, the molar extinction coefficient of Fe^{2+} ($\varepsilon_{max}=1.11\times10^4$ L/mol·cm); L, the thickness of the cuvette; t is the irradiation time of the light source, $\Phi_{Fe^{2+}}$ is 1.2 (the quantum efficiency of 500 W gallium lodine lamp at λ_{max} = 365nm).

According to the calculated results above, the AQY of 0.5S-$PtNi_x$/g-C_3N_4 is about 2.03% at 365 nm, which is higher than that of $PtNi_x$/g-C_3N_4 (1.28%), and even is 10-fold higher than that of pure g-C_3N_4 (0.2%).