SUPPLEMENTARY INFORMATION

Highly Efficient Temperature-induced Visible Light Photocatalytic Hydrogen Production from Water

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CONTENT:

1. SUPPLEMENTARY FIGURES:

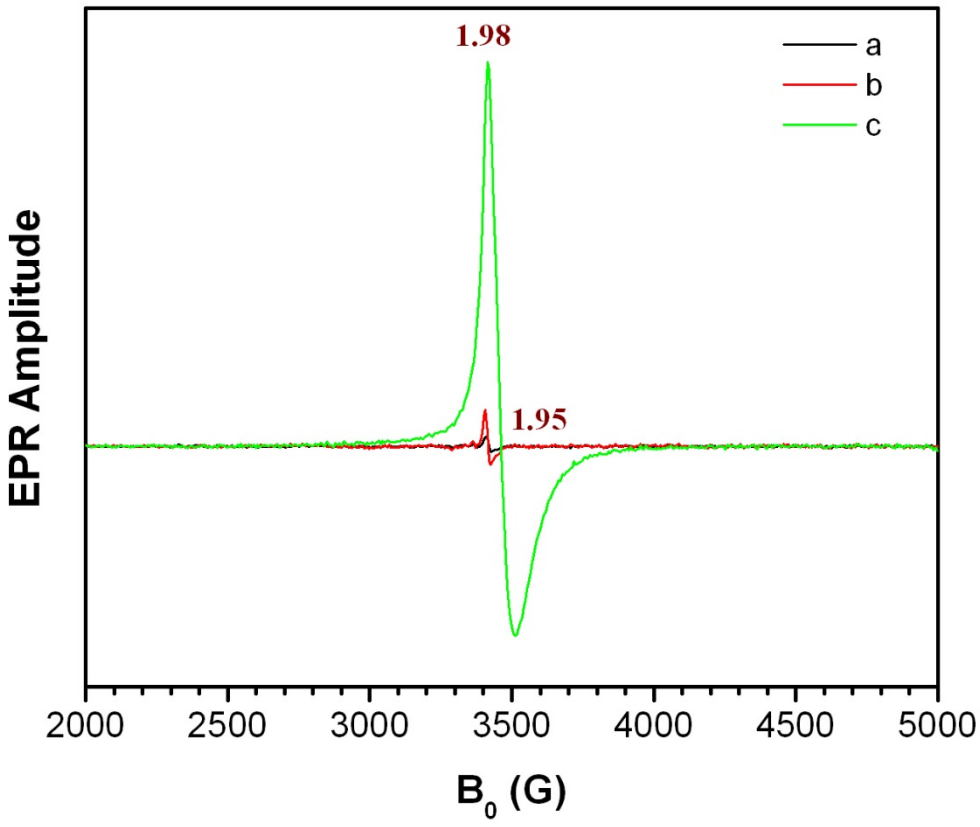

Fig. S1. EPR spectra of (a) pristine (white) TiO_2, (b) Pt/TiO_2 without hydrogenation, and (c) black Pt/TiO_2 prepared by hydrogenation. The spectra were recorded at 77 K with g value of 1.98 for white TiO_2 and unreduced Pt/TiO_2 and 1.95 for black Pt/TiO_2. It is well-known that a peak at g = 1.95~1.98 is characteristic of a paramagnetic Ti^{3+} center.[S1] The peak intensity of Ti^{3+} is very small for white TiO_2 and unreduced Pt/TiO_2, indicating their negligible amount of Ti^{3+}. In contrast, the black Pt/TiO_2 exhibits a large amount of Ti^{3+} associated with a large peak of Ti^{3+} in EPR spectrum.

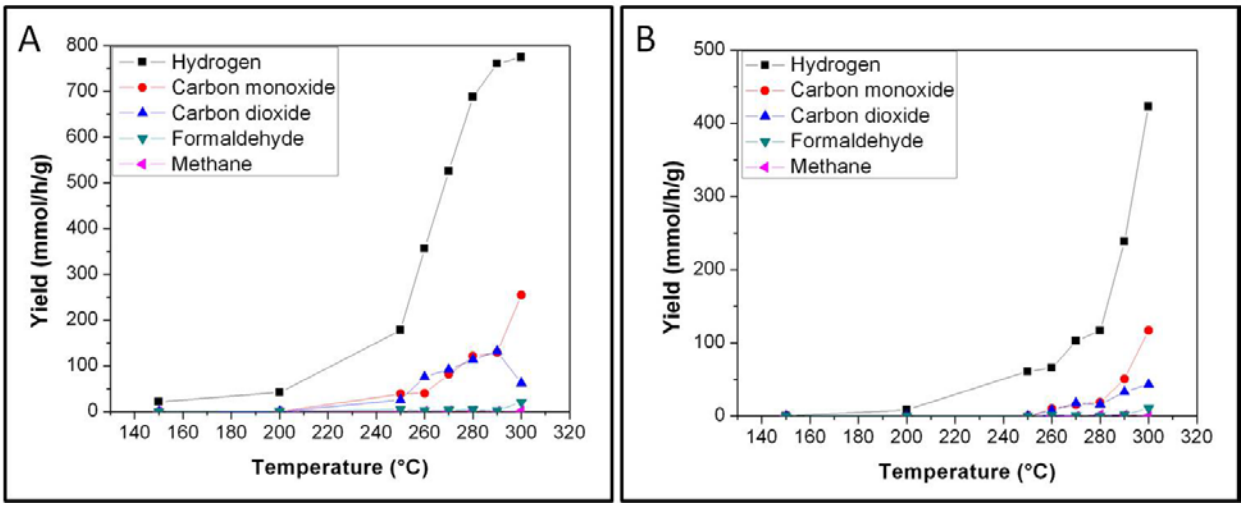

Fig. S2. Product yield vs reaction temperature for catalytic hydrogen production from H_2O with methanol (30%, as a sacrificial agent) over black Pt/TiO_2 catalyst dispersed on light-diffuse-reflection-surface of a SiO_2 substrate with AM 1.5 global sunlight illumination (A) and without AM 1.5 global sunlight illumination (B).

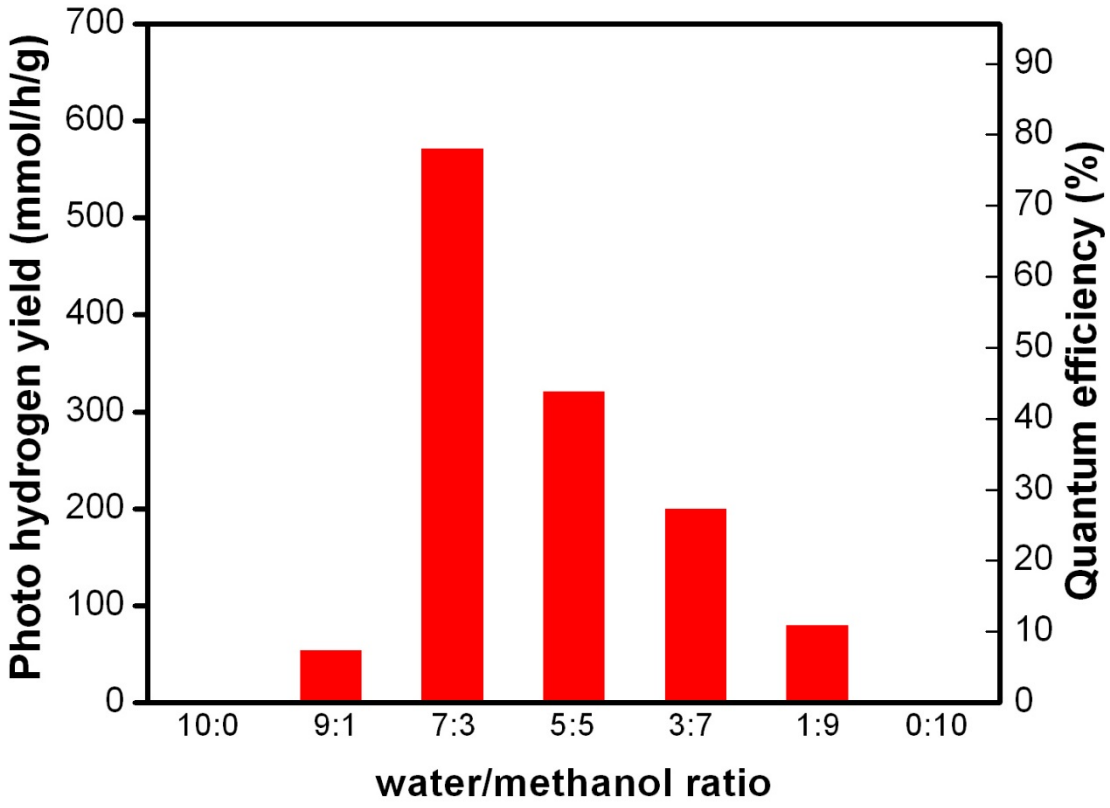

Fig. S3. Photocatalytic hydrogen production from H_2O with methanol as a sacrificial agent over black Pt/TiO_2 catalyst dispersed on the light-diffuse-reflection-surface of SiO_2 substrate under AM 1.5 global sunlight illumination at 280 ^oC. Photo-hydrogen yield (equal to the difference of hydrogen yields with and without light irradiation) and apparent quantum efficiency increase with decreasing water/methanol ratio and then decreases. The maximum values can be obtained at water/methanol ratio of 7/3.

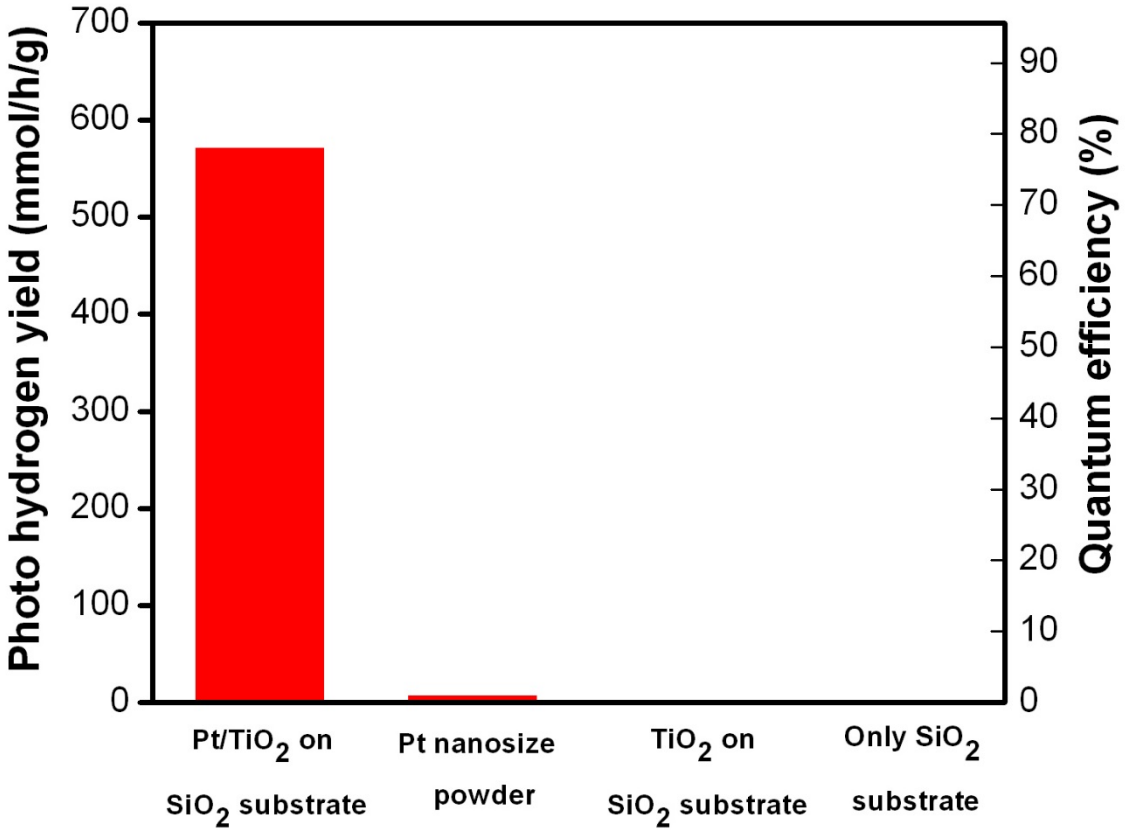

Fig. S4. Photocatalytic hydrogen production from H_2O with 30% methanol as a sacrificial agent under AM 1.5 global sunlight illumination at 280 ^oC. Either SiO_2 substrate or TiO_2 on SiO_2 substrate doesn't exhibit photocatalytic activity. The photo-hydrogen yield and apparent quantum efficiency are negligible for Pt dispersed on SiO_2 substrate. Only black Pt/TiO_2 catalyst dispersed on SiO_2 substrate exhibits an excellent photo-hydrogen yield (571 mmol/h/gcat) with a high apparent quantum efficiency (78.0%).

2. SUPPLEMENTARY MOVIE

A movie was recorded for the impressive photocatalytic hydrogen production process from water with 30% methanol as a sacrificial agent over black Pt/TiO_2 catalyst dispersed on the light-diffuse-reflection-surface of SiO_2 substrate under 1.5 AM global sunlight illumination at room temperature (please watch *Supplementary* ***Movie S1***).

3. REFERENCES

S1. Xing, M.; Zhang, J.; Chen, F.; Tian, B. An Economic Method to Prepare Vacuum Activated Photocatalysts with High Photo-activities and Photosensitivities, *Chem. Commun.* **2011**, *47*, 4947-4949.