Supporting Information for

Green solid-state synthesis and photocatalytic hydrogen production activity of anatase TiO_2 nanoplates with super heat-stability

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Table S1. The TiO_2 samples prepared by the calcination of NH_4TiOF_3 precursors (T1) at different temperature. The NH_4TiOF_3 precursors prepared by the solid-state chemical reaction between H_3BO_3 and $(NH_4)_2TiF_6$. The molar ratio of reactants ($(NH_4)_2TiF_6$ and H_3BO_3) is 4:3.

Nomination	T2	T3	T4	T5	T6	T7	T8	T9	T10
The calcinations temperature (°C)	200	300	400	500	600	700	800	900	1000

The average size of samples and their increment after calcinated at different temperature were further calculated by the Scherrer formula and showed in Table S2. The results indicate that higher calcinations temperature maybe lead to larger average size of the samples.

Table S**2**. The average size and their increment of the obtained samples.

Nomination	**T4**	**T6**	**T8**	**T10**
The average size of samples (nm)	18.2	22.2	55.7	136.0
The increment of the size (nm)	-	4	33.5	80.3

Table S3 shows the BET surface area, average pore diameter, content of B element, amount of H_2 production and QE of sample T4, T6, T8, T10. The surface area of sample T4, T6, T8 and T10 is 38.273, 42.606, 21.905 and 10.642 $m^2 \cdot g^{-1}$ respectively. The specific surface areas firstly increase, then decrease with the rise of the heating temperature. The larger specific surface area would enhance the harvesting of light and provide more surface active sites for the adsorption of reactant molecules. So it maybe enhance the photocatalytic activity.

Table S3. The BET surface area, average pore diameter, content of B element, amount of H_2 production and QE of sample T4, T6, T8, T10.

	T4	T6	T8	T10
Surface area ($m^2 \cdot g^{-1}$)	38.273	42.606	21.905	10.642
Average pore diameter (nm)	3.66	6.49	16.98	14.0
Content of B element	0	0	0	0
Amount of H_2 production (μmol / g)	14014	33564	55614	5845
Quantum efficiency (QE) (%)	0.05	0.13	0.93	0.03

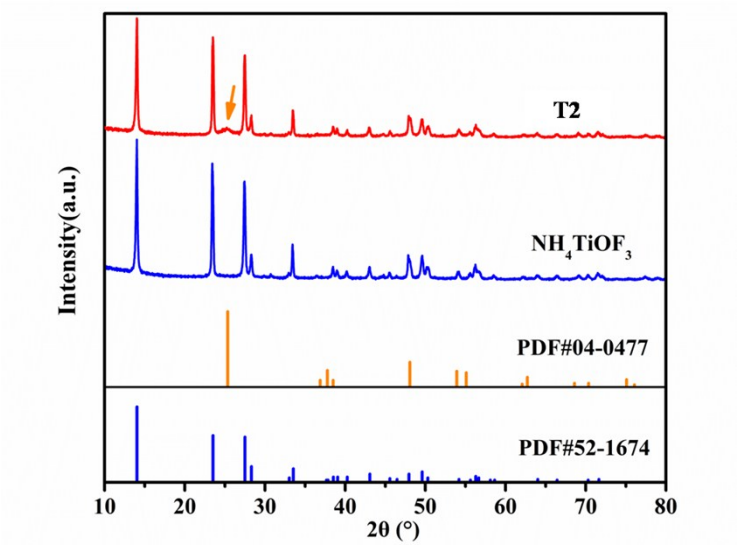

Fig. S1. The XRD patterns of the precursor before and after calcinated at 200°C. When the sintered temperature is 200°C, the typical peak of anatase TiO_2 at 2θ = 25.354° was observed in the XRD patterns of T2 , which indicated that the precursor started to convert to anatase TiO_2 at 200°C.

Fig. S2 shows the high-resolution XPS spectra of F 1s (a) and B 1s (b) in the sample T8. It can be seen in Fig. S2 that there is not obvious photoelectron peak of F and B element in the obtained sample T8. The Inductively coupled plasma (ICP) analysis also confirms that these is not B element in sample T8. (Table S3)

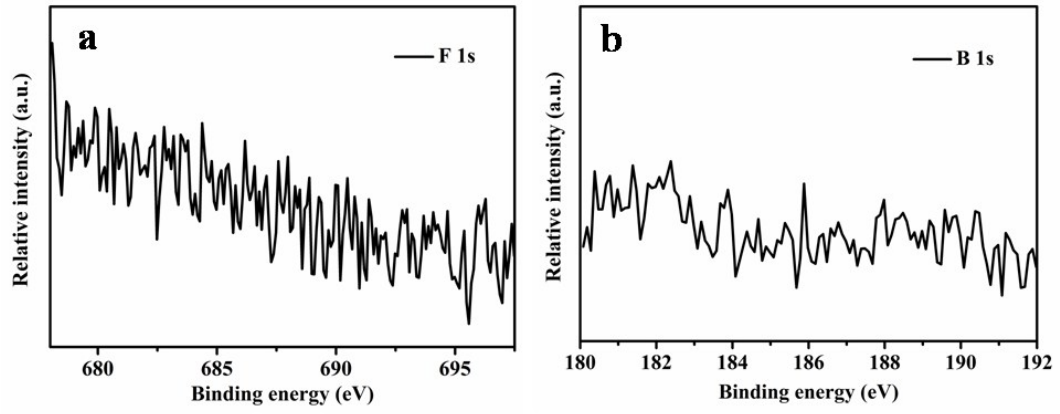

Fig. S2. The high-resolution XPS spectra of F 1s (a) and B 1s (b) in the sample of T8.

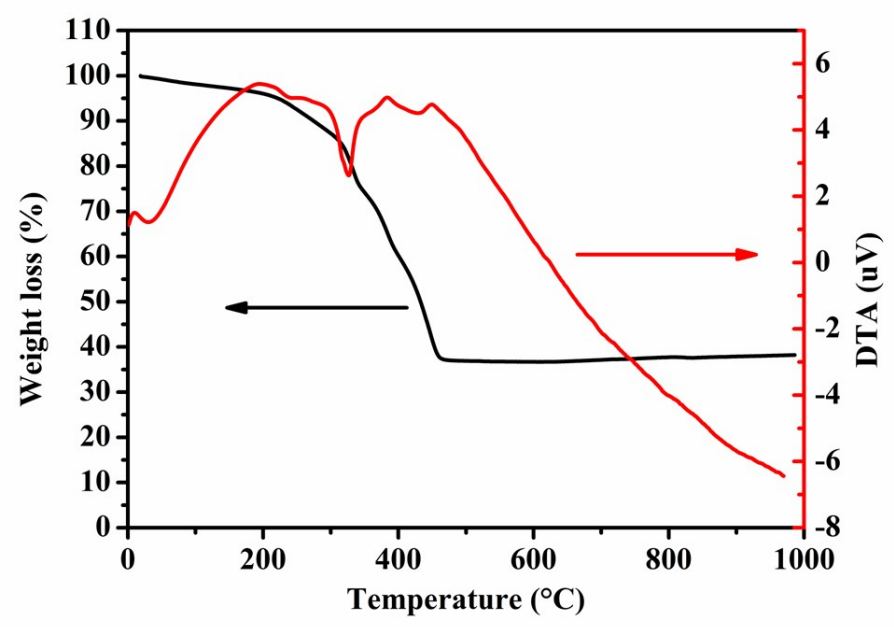

Fig. S3. The thermal analysis (TGA and DTA) of the precursor T1

It can be seen in Fig. S3 that the weight loss of precursor T1 begins at 20°C, and end at 430°C. The weight loss will not happen during 430°C ~1000°C. It indicates that the TiO_2 obtained by annealing the NH_4TiOF_3 was able to bear high temperature and maintained a stable anatase phase until 1000°C, which are consistent with the results come from the XRD.