Electronic Supplementary Information for the manuscript

Selective Oxidation of Alcohols on Hydrogen Titanate Nanotubes under Visible Light Irradiation: Relationship between Nanostructure and Catalytic Activity

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Table S1 Specific surface areas and total pore volumes of H-titanate nanotubes, nanosheets and nanofibers.

Photocatalyst	H-titanate nanotubes	H-titanate nanosheets	H-titanate nanofibers
Surface area ($m^2 \cdot g^{-1}$)	290	116	37
Pore volume ($cm^3 \cdot g^{-1}$)	0.57	0.34	0.09

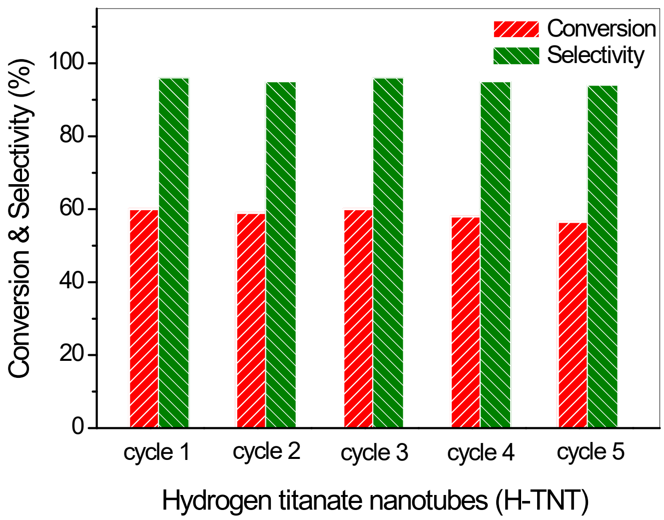

Fig. S1 Cycle runs of H-TNT toward selective oxidation of *p*-methoxy benzyl alcohol under visible light irradiation for 6 h.

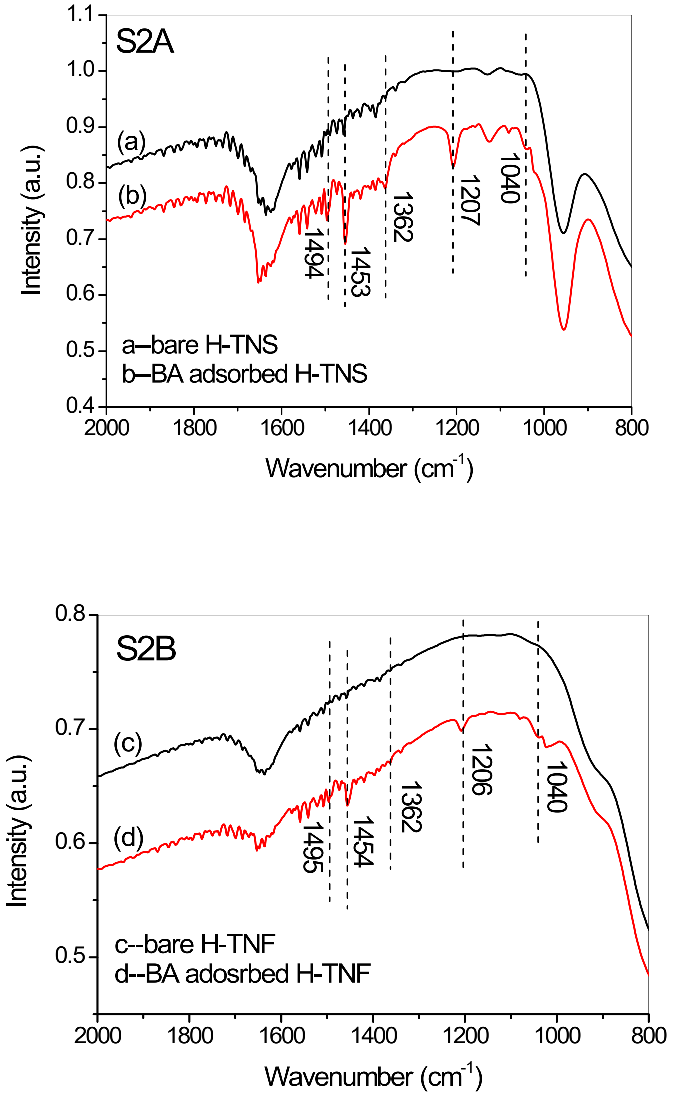

Fig. S2A FT-IR spectra of bare H-TNS and BA adsorbed H-TNS; **S2B** FT-IR spectra of bare H-TNF and BA adsorbed H-TNF.

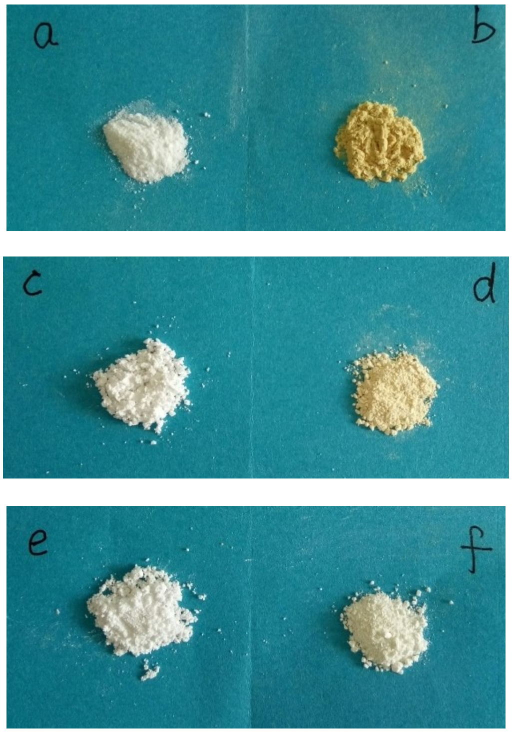

Fig. S3 The pictures of various H-titanate samples before and after adsorbed by BA: (a) H-TNT, (b) BA adsorbed on H-TNT, (c) H-TNS, (d) BA adsorbed on H-TNS, (e) H-TNF, and (f) BA adsorbed on H-TNF.

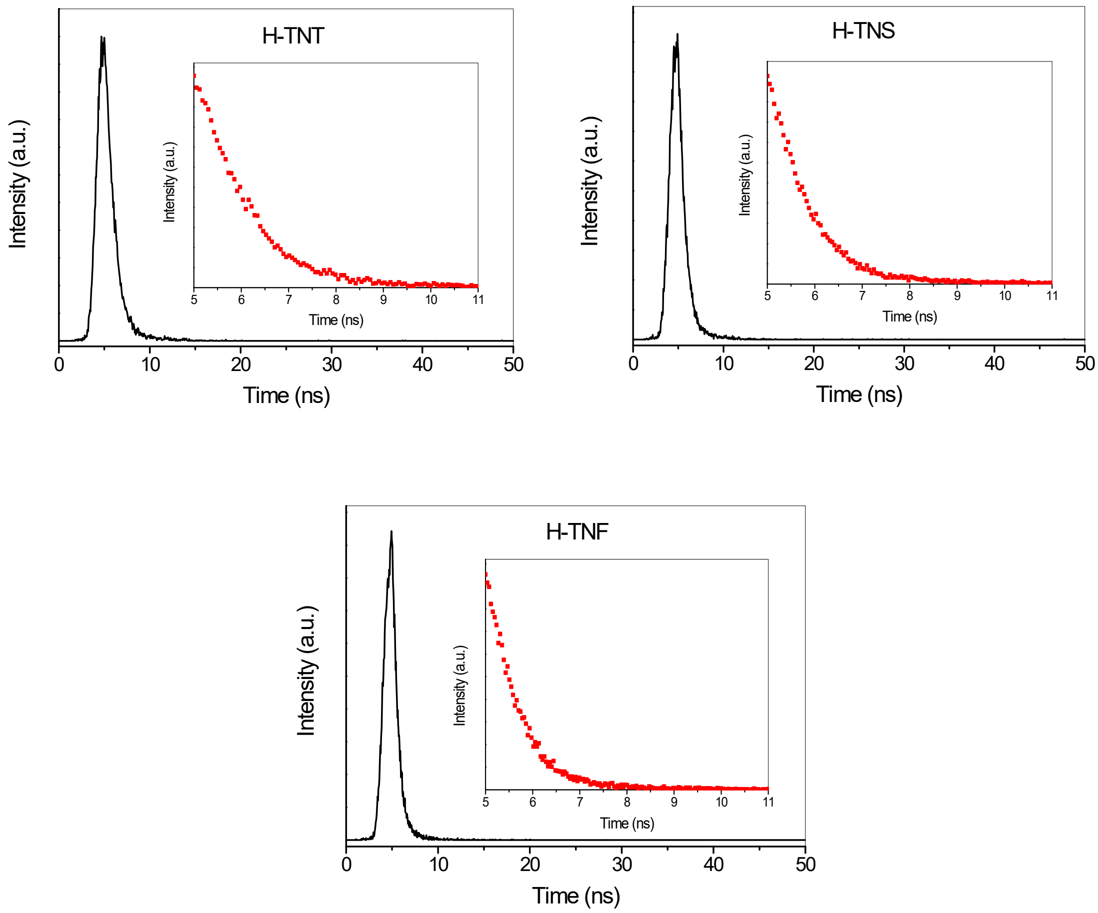

Fig. S4 Time-resolved photoluminescence decay curves for H-TNT, H-TNS and H-TNF (excited at 371 nm).

Table S2 Time constants (τ) and relative amplitudes (a) from double-exponential fitting to the PL decay curves of H-TNT, H-TNS and H-TNF.

Photocatalyst	τ_1 (ns)	τ_2 (ns)	a_1 (%)	a_2 (%)	Goodness of fit parameter, χ^2
H-TNT	0.732	2.026	77.14%	22.86%	1.021
H-TNS	0.625	1.801	87.09%	12.91%	0.992
H-TNF	0.573	1.584	85.73%	14.27%	1.017

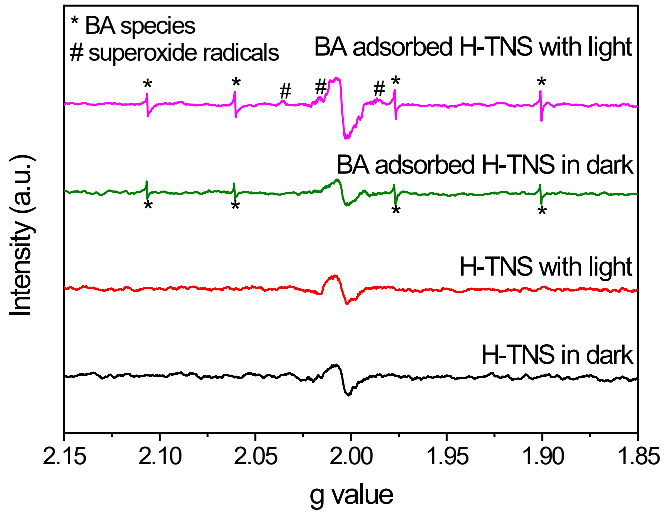

Fig. S5 ESR spectra of bare H-TNS and BA adsorbed H-TNS both in the darkness and under visible light irradiation at 77 K.

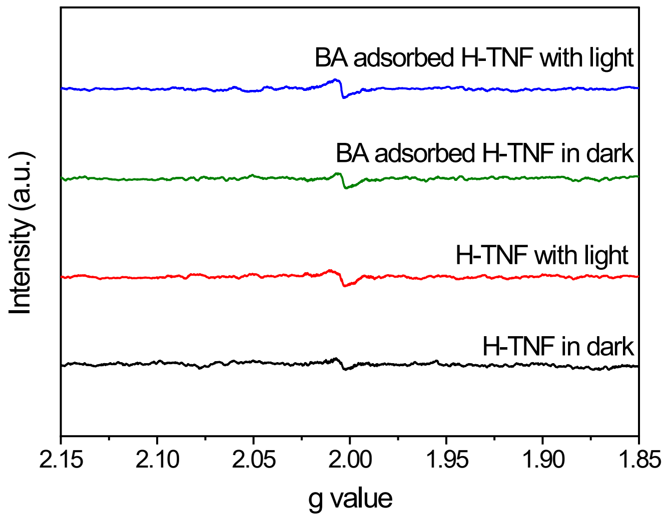

Fig. S6 ESR spectra of bare H-TNF and BA adsorbed H-TNF both in the darkness and under visible light irradiation at 77 K.

Schematic models for an ideal H-titanate nanotubes, nanosheets and the estimation of ideal surface area per unit weight.

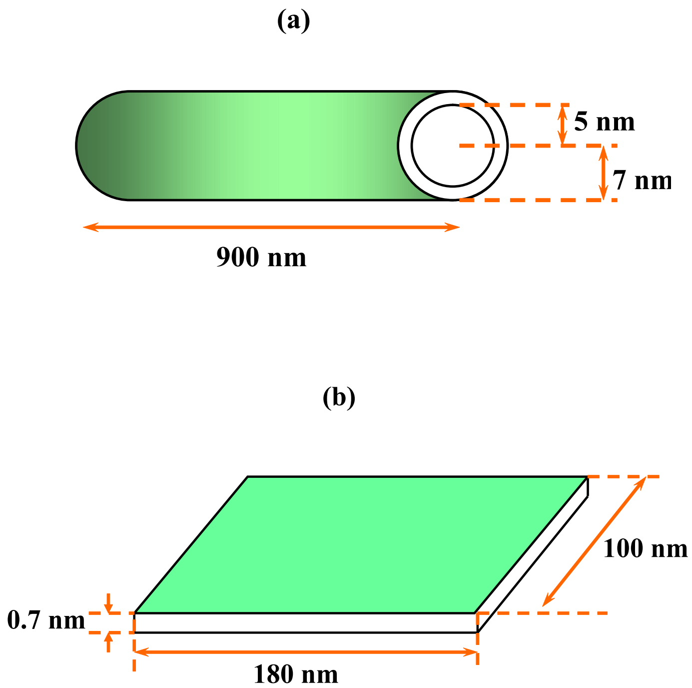

Fig. S7 Schematic models for an ideal (a) H-TNT and (b) H-TNS.

The ideal surface area per unit weight of a tube (S_{tube}) and sheet (S_{sheet}) can be estimated geometrically from the following expressions:

$$\boldsymbol{S_{tube} = (2\pi r_o l + 2\pi r_i l) / [(r_o^2 - r_i^2)\pi l d]} \quad (1)$$

$$\boldsymbol{S_{sheet} = 2(xy + xt + yt) / xytd} \quad (2)$$

where r_o and r_i are the outer and inner radius of nanotube (H-TNT), d is the density of the material, l is the length of H-TNT, t is the thickness of nanosheet (H-TNS), and x and y are the lengths of longitudinal and lateral directions of nanosheet, respectively. S_{tube} is calculated to be 313 $m^2 \cdot g^{-1}$ for H-TNT, using r_o =7.0 nm, r_i = 5.0 nm, d =3.2 $g \cdot cm^{-3}$, and l =900 nm (see Fig. S7a). S_{sheet} is calculated to be 903 $m^2 \cdot g^{-1}$ for H-TNS, using x = 100 nm, y = 180 nm, d =3.2 $g \cdot cm^{-3}$, and t =0.7 nm (Fig. S7b), because the thickness of titanate nanosheet is reported to be 0.7 nm.[1]

Reference:

1 N. Sakai, Y. Ebina, K. Takada and T. Sasaki, *J. Am. Chem. Soc.*, 2004, **126**, 5851-5858.