

## Supporting information (SI)

### **Dynamics of photogenerated charges in the phosphate modified TiO<sub>2</sub> and the enhanced activity for photoelectrochemical water splitting**

Liqiang Jing<sup>†, ‡, \*</sup>, Jia Zhou<sup>‡</sup>, James R. Durrant<sup>†</sup>, Junwang Tang<sup>§</sup>,

Dening Liu<sup>‡</sup>, Honggang Fu<sup>‡</sup>

<sup>†</sup> *Department of Chemistry, Imperial College London, Exhibition Road, London SW7 2AZ, UK;*

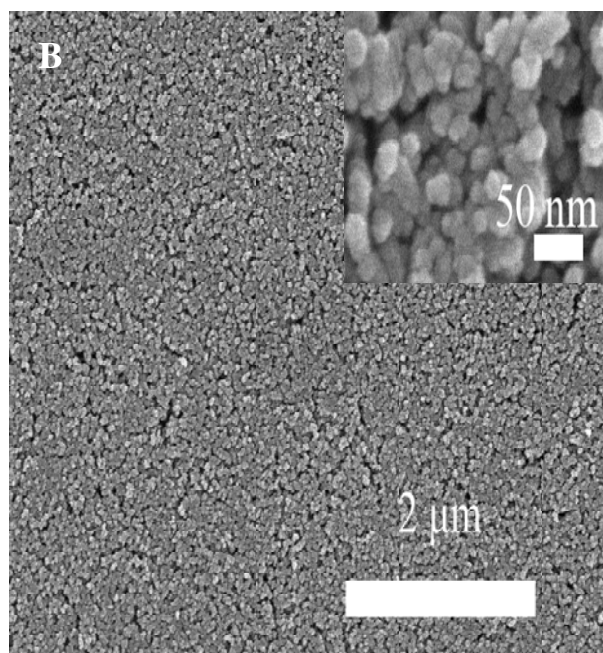
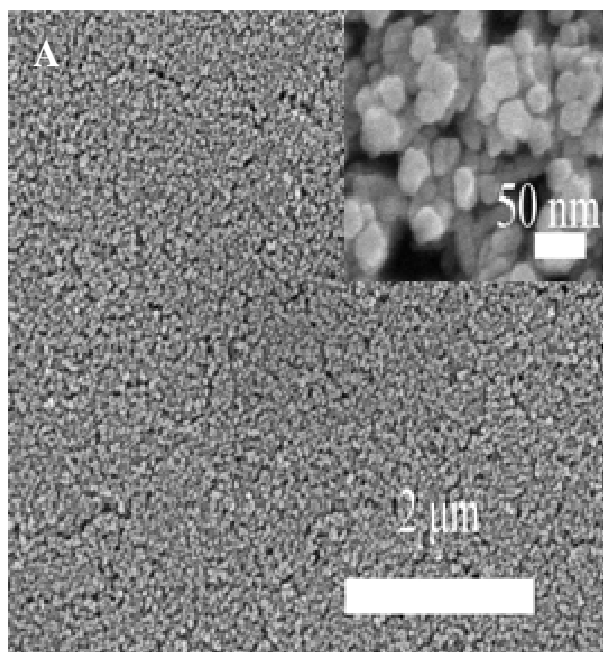
<sup>‡</sup> *Key Lab of Functional Inorganic Materials Chemistry (Heilongjiang University), Ministry of Education,*

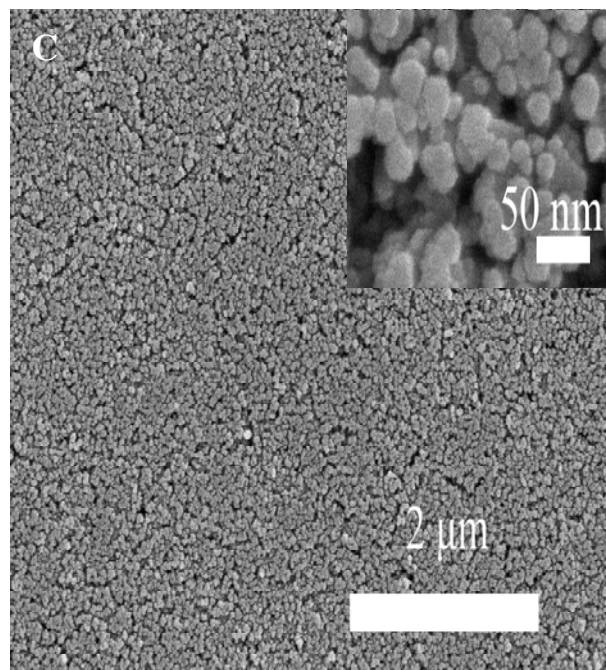
*School of Chemistry and Materials Science, Harbin 150080, P. R. China;*

<sup>§</sup> *Department of Chemical Engineering, University London WC1E7JE, UK. College London, Torrington Place*

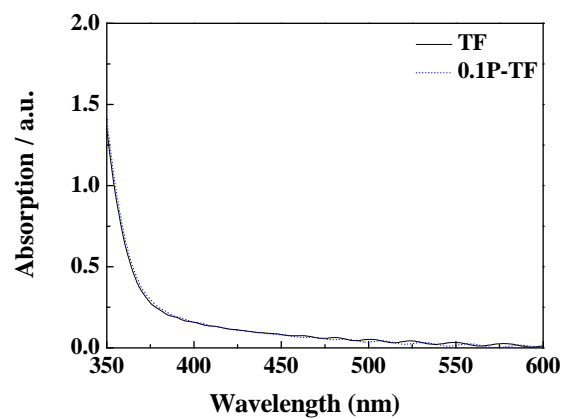
\*Address correspondence to [Jinglq@hlju.edu.cn](mailto:Jinglq@hlju.edu.cn).

**SI-I** SEM images (A: TF, B: 0.1P-TF, and C: 0.5P-TF. Inset shows the corresponding image with high magnification).

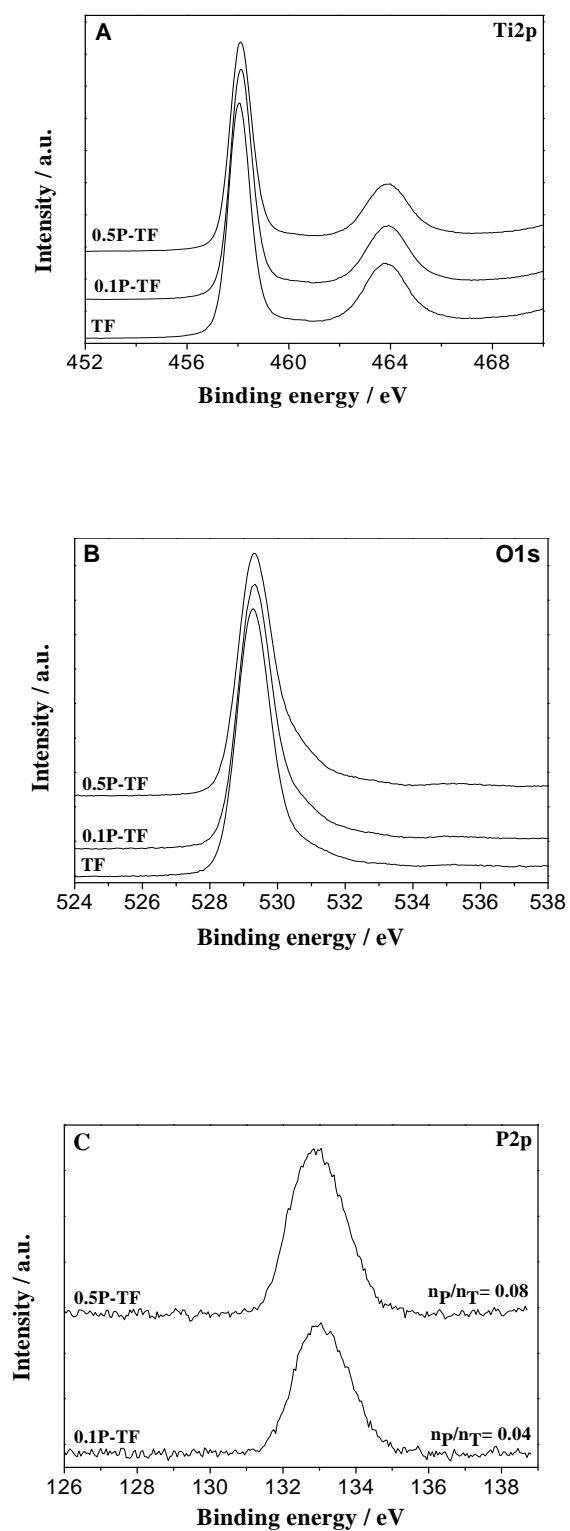




**SI-II** Uv-Vis spectra (TF and 0.1P-TF).

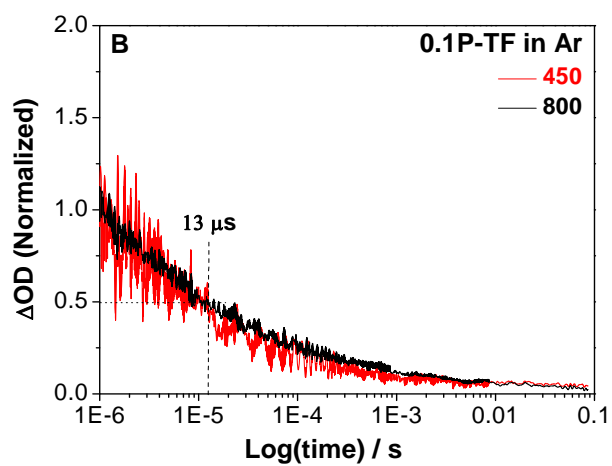
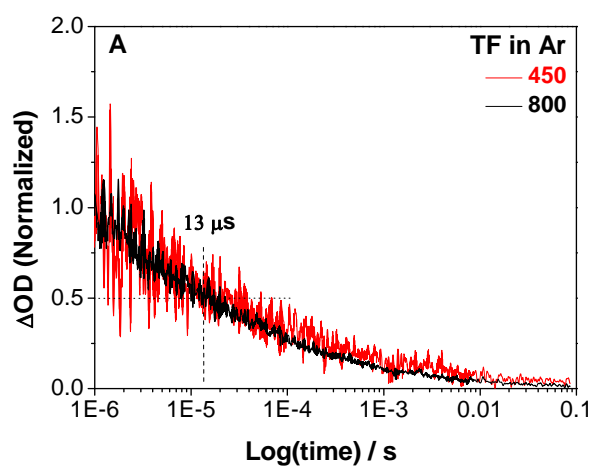


SI-III XPS spectra of Ti2p (A), O1s (B) and P2p (C).



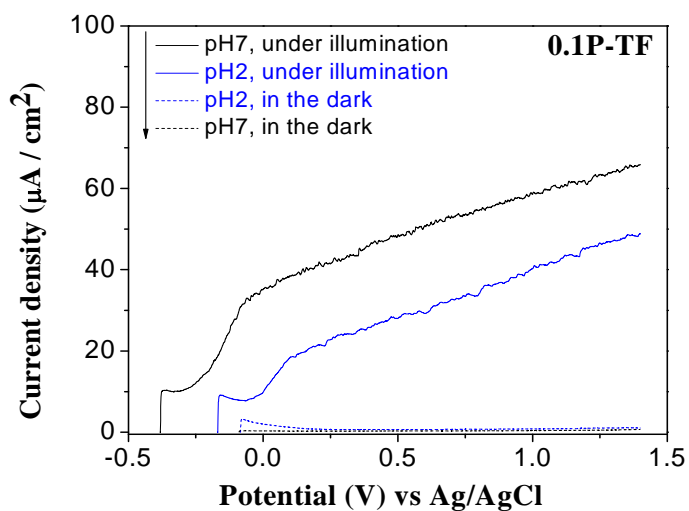
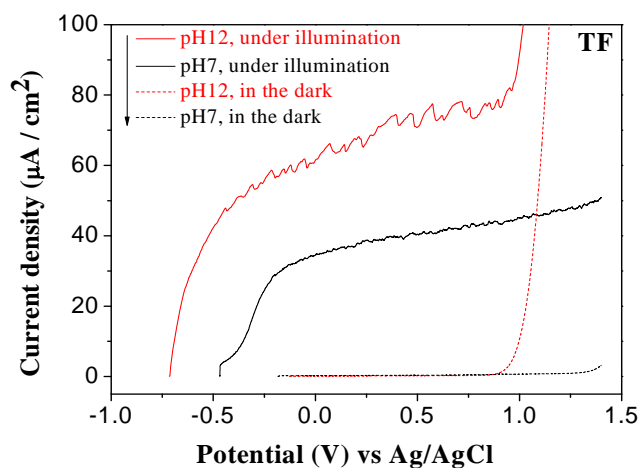
**SI-IV** Temporal profile of transient absorption spectra of photoelectrons and photoholes of TF (A)

and 0.1P-TF (B) in argon.

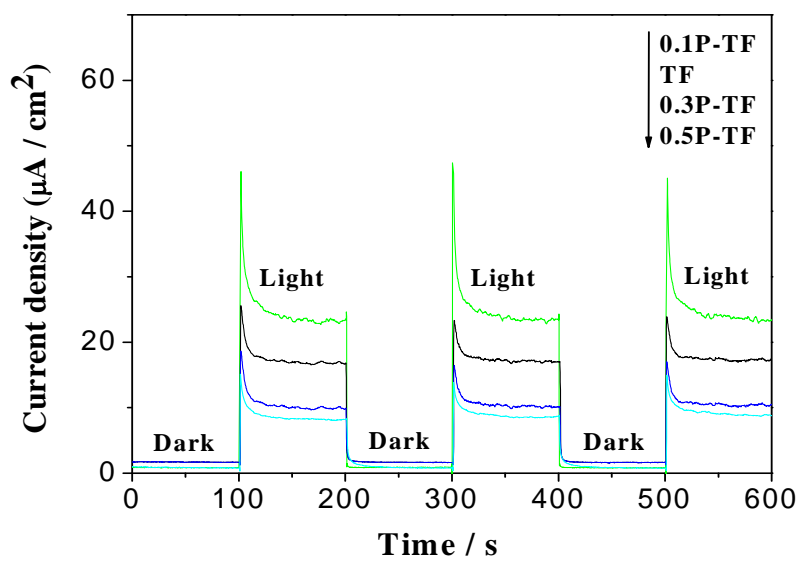


SI-V I-V curves of TF and 0.1P-TF under illumination (solid line) and in the dark (dash line).

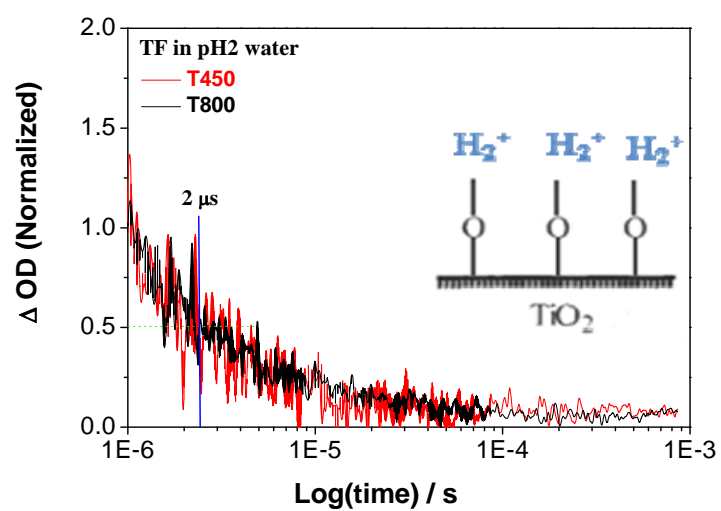
Potentials were measured against a Ag/AgCl (saturated KCl solution) reference electrode in an argon-bubbled 0.5 M NaClO<sub>4</sub> solution, in which the pH value was altered by adding desired-amount HCl or NaOH solution.



**SI-VI** I-t curves of different TiO<sub>2</sub> film electrodes under illumination and in the dark. Potentials are measured against a Ag/AgCl (saturated KCl solution) reference electrode in an argon-bubbled 0.5 M NaClO<sub>4</sub> solution. (TF: black, 0.1P-TF: green, 0.3P-TF: blue, and 0.5P-TF: cyan)



**SI-VII** Temporal profile of transient absorption spectra of photoelectrons and photoholes of TF in pH2 water (Inset means surface carried charges of TiO<sub>2</sub>).





**SI-VIII** I-V curves of TF under illumination (solid line) and in the dark (dash line). Potentials were measured against a Ag/AgCl (saturated KCl solution) reference electrode in an argon-bubbled 0.5 M NaClO<sub>4</sub> solution, in which the pH value was altered by adding desired-amount HCl solution.

