Supporting information (SI)

Dynamics of photogenerated charges in the phosphate modified TiO₂ and the enhanced activity for photoelectrochemical water splitting

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**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 NaClO₄ solution, in which the pH value was altered by adding desired-amount HCl or NaOH solution.
**SI-VI** I-t curves of different TiO$_2$ 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$_4$ 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 TiO₂).
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 NaClO₄ solution, in which the pH value was altered by adding desired-amount HCl solution.