Supporting Information for

Impact of Oxygen Vacancies on TiO_2 Charge Carrier Transfer for Photoelectrochemical Water Splitting

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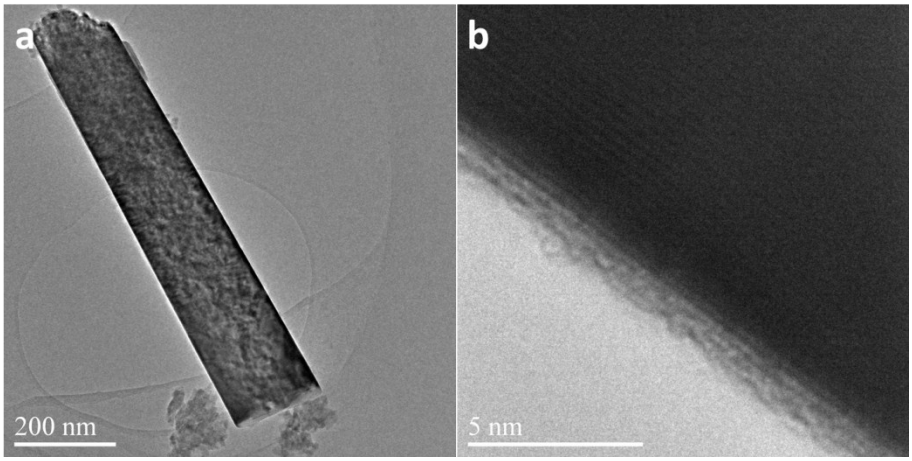

Figure S1 TEM images of pristine TiO_2 with a (a) low and (b) high magnification.

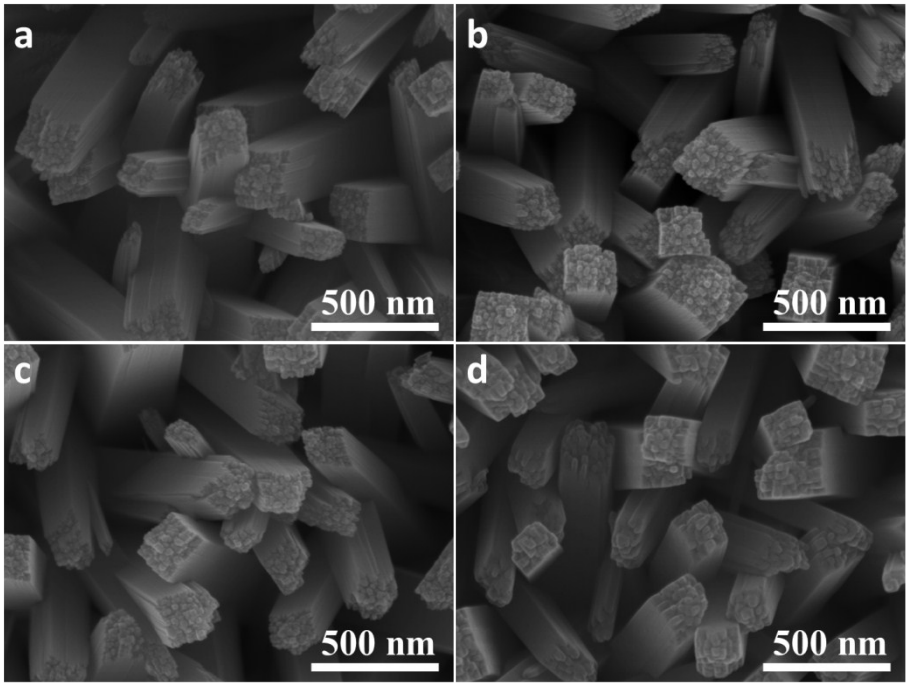

Figure S2 SEM images of (a) TiO_2-300, (b) TiO_2-400, (c) TiO_2-500 and (d) TiO_2-600 photoanodes, respectively.

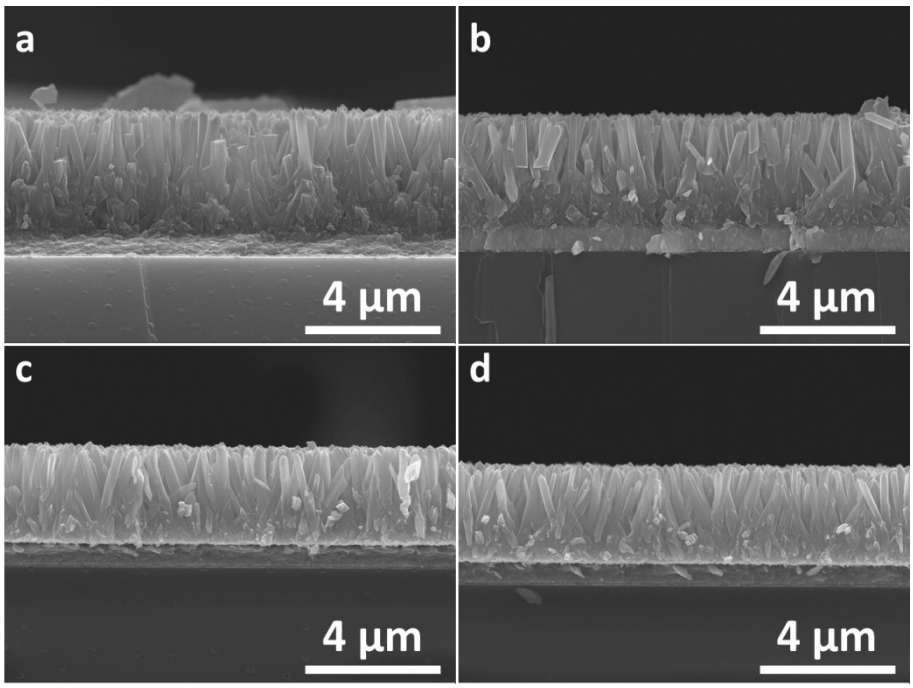

Figure S3 SEM images of (a) TiO_2-300, (b) TiO_2-400, (c) TiO_2-500 and (d) TiO_2-600 photoanodes in side view.

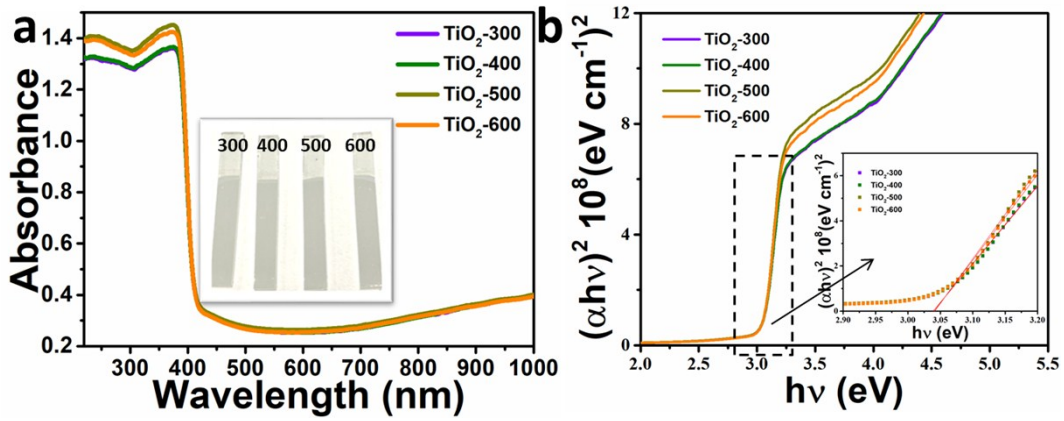

Figure S4 (b) UV–vis diffuse-reflectance spectra and (b) band gap energy of TiO_2-300, TiO_2-400, TiO_2-500 and TiO_2-600 photoanodes, respectively.

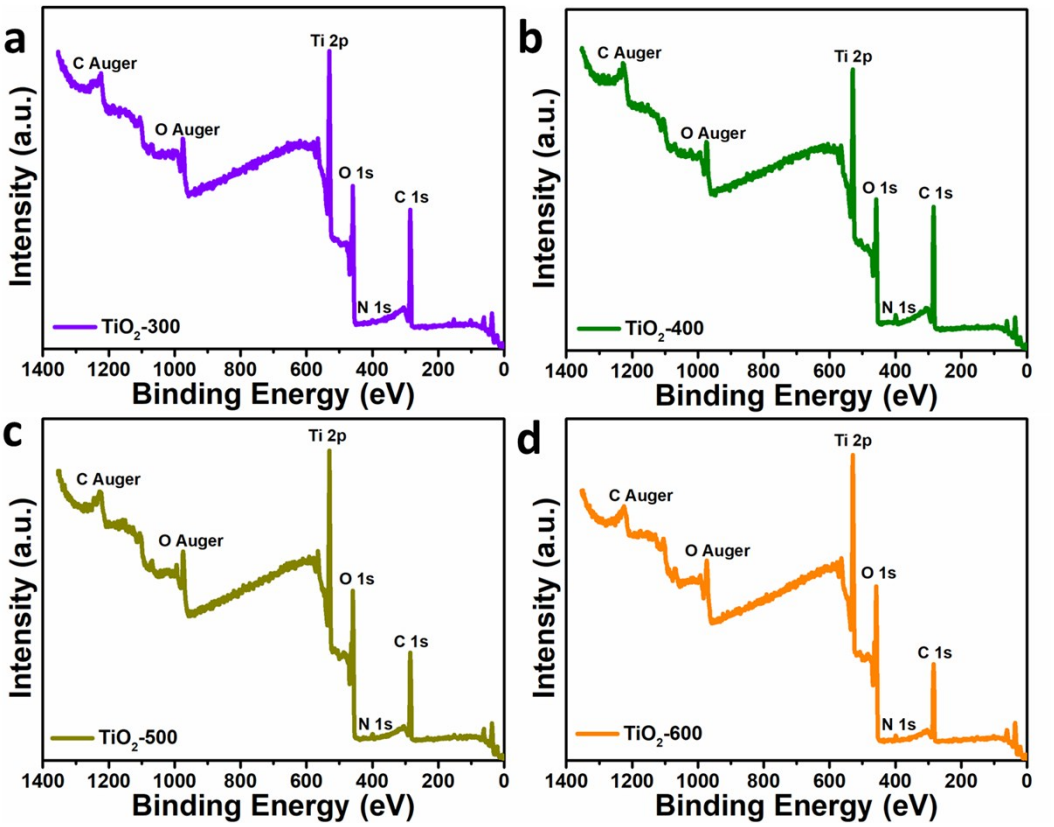

Figure S5 The full XPS spectra of (a) TiO_2-300, (b) TiO_2-400, (c) TiO_2-500 and (d) TiO_2-600 photoanodes, respectively.

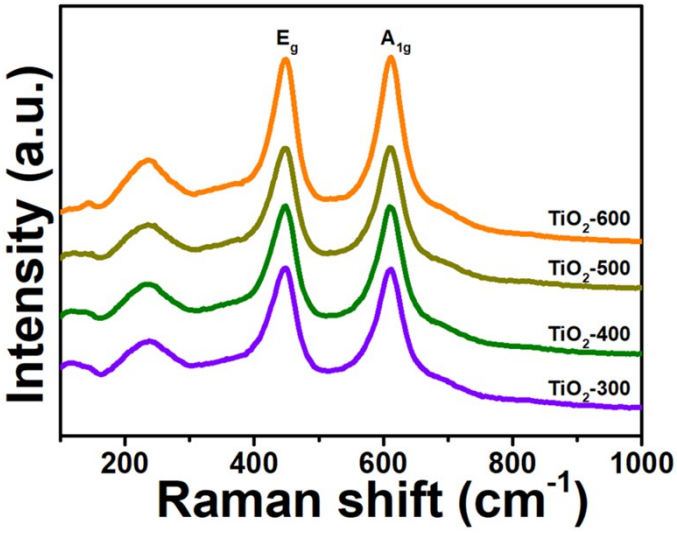

Figure S6 Raman spectra of TiO_2-300, TiO_2-400, TiO_2-500 and TiO_2-600 photoanodes.

Table S1 Comparison studies for various TiO_2 photoanodes and their PEC performances.

Samples	Applied bias	Electrolyte	J (mA cm^{-2})	References
TiO_2 fiber	1.23 V *vs.* RHE	1 M NaOH	~0.18	10
TiO_2 nanorod	0.5 V *vs.* Ag/AgCl	1 M NaOH	~0.82	11
TiO_2 nanotube	0.6 V *vs.* Ag/AgCl	1 M NaOH	~0.5	13
Anatase TiO_2	0.6 V *vs.* Ag/AgCl	KOH with 10% Methanol	~1.02	38
Branched TiO_2	1.23 V *vs.* RHE	0.1 M NaOH	~1.29	39
Ni/TiO_2	0.6 *vs.* Ag/AgCl	1M KOH	~0.16	40
TiO_2-400	1.23 V *vs.* RHE	0.5 M Na_2SO_4	~1.23	This work

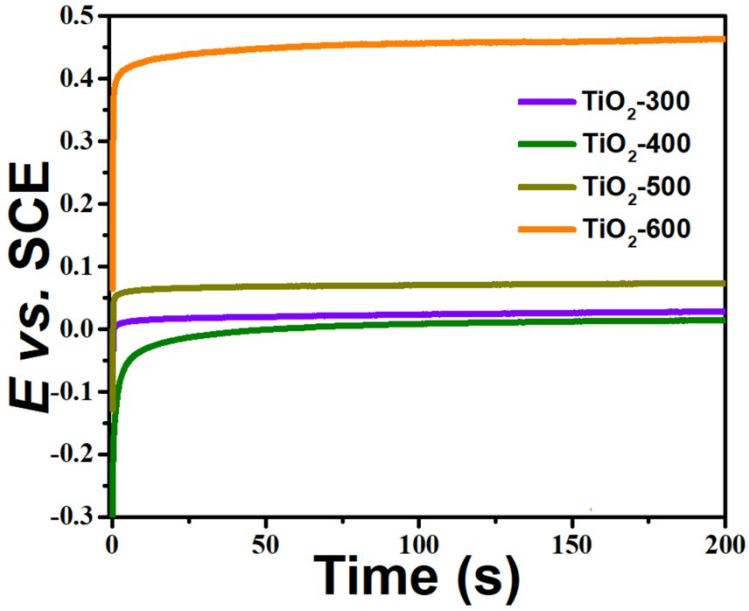

Figure S7 The measured Galvanostatic-Time curves at 0.2 mA cm^{-2} for TiO_2-300, TiO_2-400, TiO_2-500 and TiO_2-600 photoanodes, respectively.

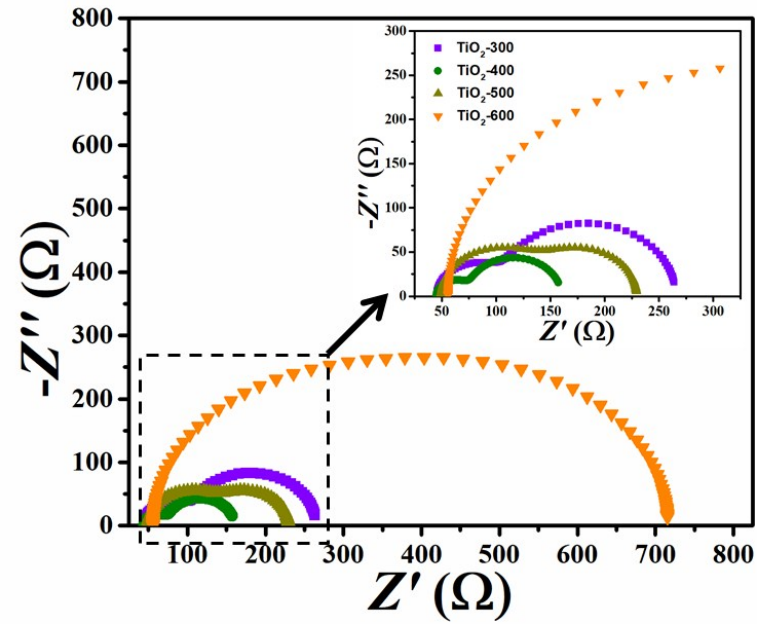

Figure S8 The fitting Nyquist plots of TiO_2-300, TiO_2-400, TiO_2-500 and TiO_2-600 photoanodes under illumination.

Table S2 Fitting EIS results of four TiO_2 photoanodes at J= 0.2 mA cm^{-2} under illumination.

pH= 7	TiO_2-300	TiO_2-400	TiO_2-500	TiO_2-600
R_1 (ohm)	60	30	90	310
C_1 (10^{-4} F)	0.12	0.35	0.10	0.04
R_2 (ohm)	160	85	90	350
C_2 (10^{-4} F)	1.0	3.5	1.0	0.14

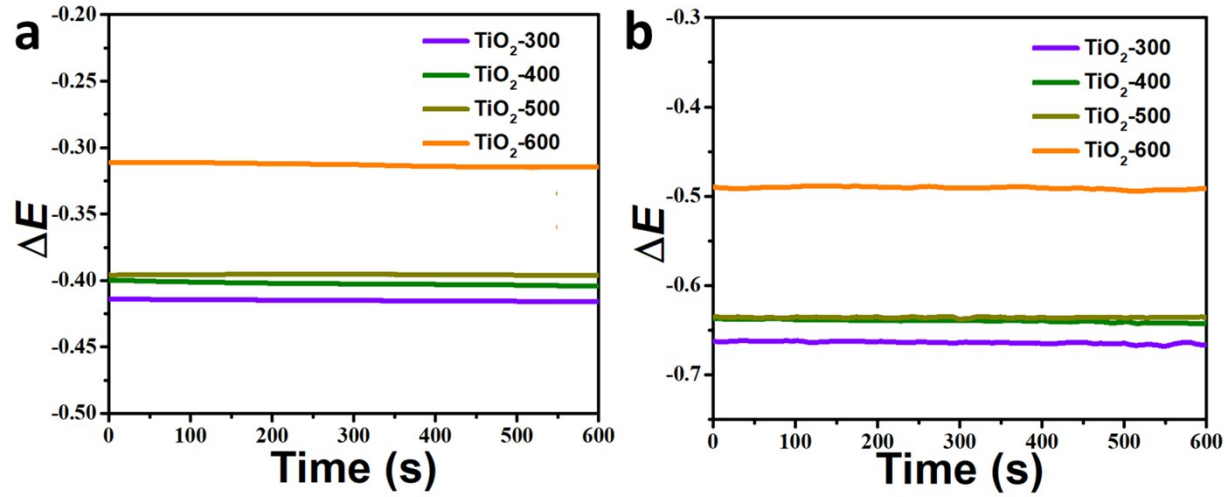

Figure S9 The measured open-circuit voltage of TiO_2-300, TiO_2-400, TiO_2-500 and TiO_2-600 photoanodes in (a) dark and in (b) light condition.