*Supporting Information*

Enhanced Photoelectrochemical Behavior of H-TiO2 Nanorods Hydrogenated by Controlled and Local Rapid Thermal Annealing

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**Table S1.** Donor density (Nd), flat band potential (Vfb) and depletion region width (W) of pristine TiO2 and H-TiO2 nanorods calculated from the Mott-Schottky plots.

**Figure S1.** (a) Optical absorption spectra of pristine TiO2 and H-TiO2 nanorods. (b) Tauc plots of optical absorption curves for pristine TiO2 and H-TiO2 nanorods.

**Figure S2.** Photoconversion efficiency of pristine TiO2 and H-TiO2 nanorods.

**Figure S3.** The O/Ti ratio distribution along the nanorod diameter (a) pristine TiO2 and (b) H-TiO2 nanorods treated at 400oC. The O/Ti ratio is estimated using EELS spectra taken from a cross-line shown in the TEM image.

**Table S1**

|  |  |  |  |
| --- | --- | --- | --- |
| Samples | Nd (cm-3) | Vfb (V vs. Ag/AgCl) | W (nm) at 0.23 V vs. Ag/AgCl |
| As-prepared | 1.50 x 1017 | -0.95 | 295 |
| 350 oC | 5.19 x 1017 | -0.95 | 160 |
| 400 oC | 2.15 x 1018 | -0.97 | 78 |
| 450 oC | 2.98 x 1017 | -0.71 | 187 |

Since it is difficult to get the real active area of 3D H-TiO2 nanorods, we followed the suggestion from Fabrega’s work and assigned a donor density (1.50 x 1017 cm-3) to the as-prepared sample. The equation to calculate the depletion region width is given as-followed:

$$W=\sqrt{\frac{2ε\_{0}ε\_{r}\left|ϕ\_{SC}\right|}{e\_{0}N\_{d}}}$$

Where Nd is the donor density, e0 is the electron charge, εr is the dielectric constant of TiO2 nanorods, ε0 is the permittivity of vacuum, ϕSC ≡ V − Vfb is the maximum potential drop in the depletion layer.

**Figure S1**

(a)

(b)

**Figure S2**

**Figure S3**

(a)

(b)