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MDPI

Supporting Materials

Black 3D-TiO_2 Nanotube Arrays on Ti Meshes for Boosted Photoelectrochemical Water Splitting

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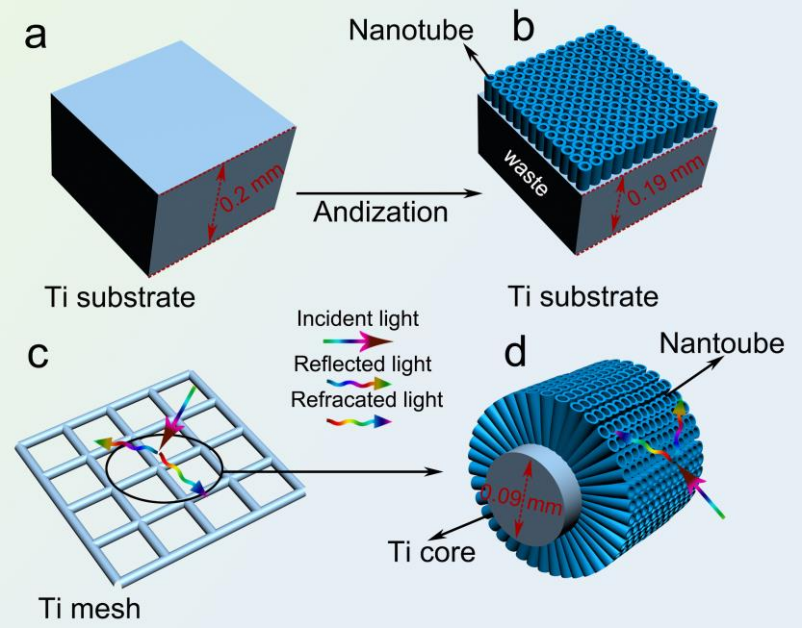


Figure S1. (a) Schematic diagram of the Ti substrate before the electrochemical anodization. (b) The 2D TiO_2 NTAs on Ti substrate. (c) Schematic diagram of the Ti mesh before the electrochemical anodization. (d) 3D schematic diagram of the 3D TiO_2 NTAs, which clearly exhibits the growth of TiO_2 NTAs on Ti mesh in a radially outward direction.

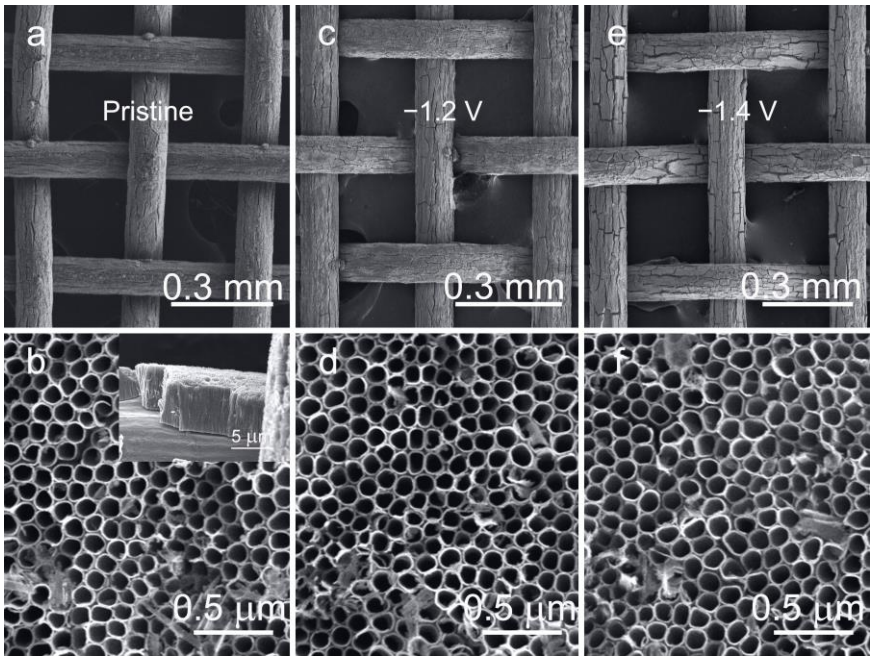


Figure S2. (a, b) FE-SEM image of the pristine 3D-TiO_2 NTAs, Inset of b: cross-sectional view FE-SEM images. (c,d) FE-SEM image of the ECR-3D-TiO_2 NTAs−1.2 V. (e, f) FE-SEM image of ECR-3D-TiO_2 NTAs−1.4 V.

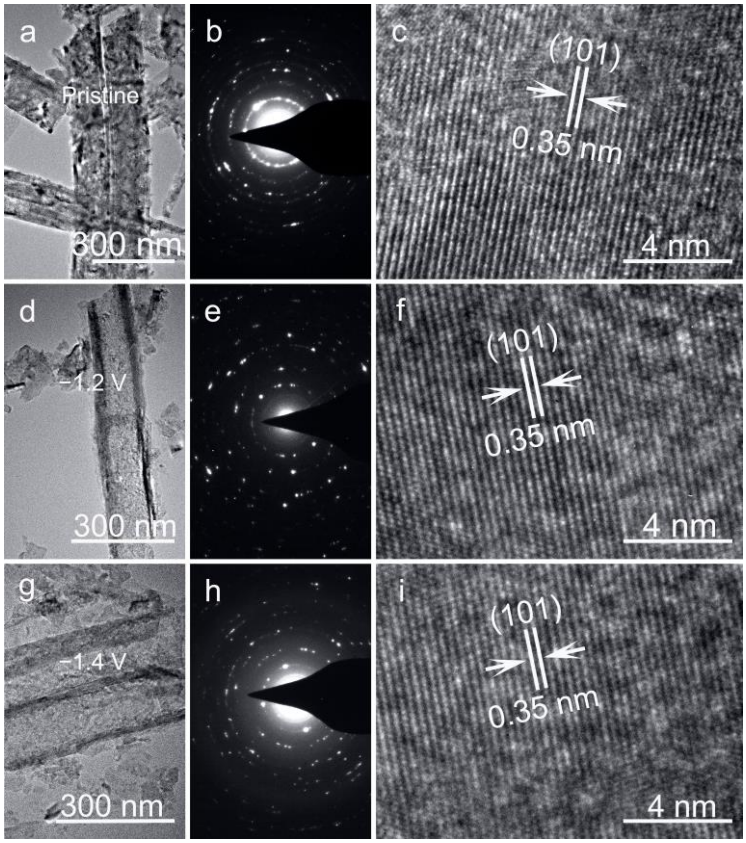


Figure S3. (a) Low-magnification FE-TEM of the pristine 3D-TiO_2 NTAs. (b, c) Selected area electron dif-fraction (SAED) pattern and HR-TEM image of the pristine 3D-TiO_2 NTAs. (d) Low-magnification FE-TEM of the ECR-3D-TiO_2 NTAs−1.2 V. (e, f) Selected area electron dif-fraction (SAED) pattern and HR-TEM image of the ECR-3D-TiO_2 NTAs−1.2 V. (g) Low-magnification FE-TEM of the

ECR-3D-TiO_2 NTAs−1.4 V. (h, i) Selected area electron dif-fraction (SAED) pattern and HR-TEM image of the ECR-3D-TiO_2 NTAs−1.4 V.

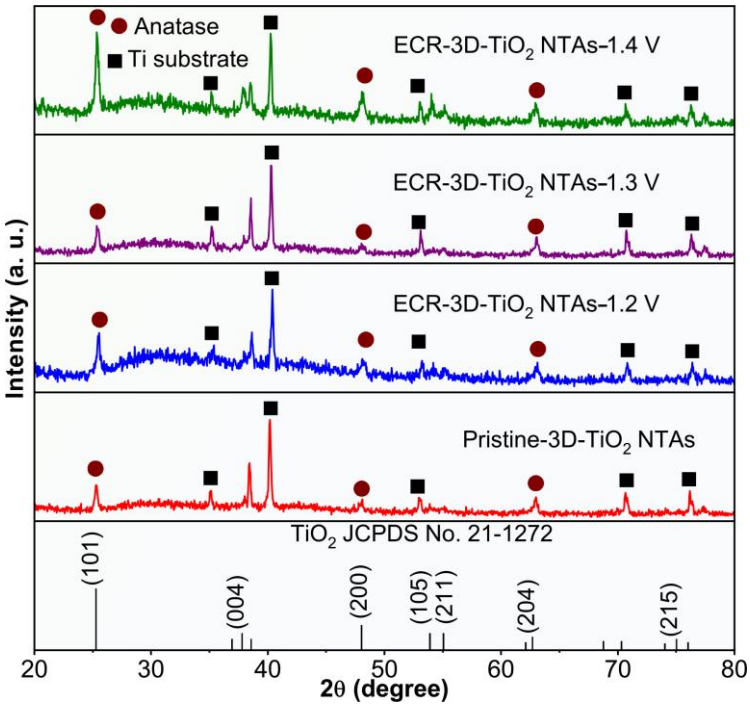


Figure S4. XRD patterns of the pristine 3D TiO_2 NTAs and ECR-3D TiO_2 NTAs electrochemically reduced under different applied bias −1.2, −1.3 and −1.4 V.

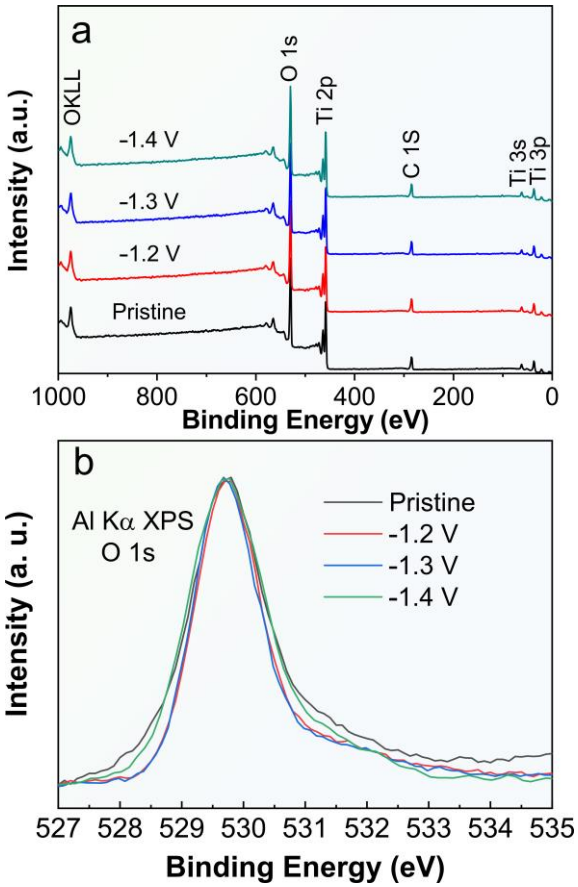


Figure S5. (**a**) Survey spectrum of the pristine and ECR-3D TiO_2 NTAs electrochemically reduced under the different applied bias −1.2, −1.3 and −1.4 V. (**b**) O1s XPS spectra of pristine and ECR-3D TiO_2 NTAs electrochemically reduced under the different applied bias −1.2, −1.3 and −1.4 V.

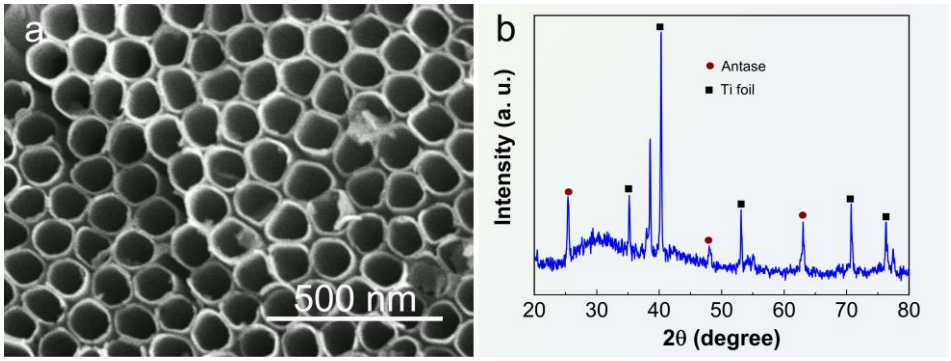


Figure S6. (**a**) FE-SEM image and (**b**) XRD pattern of the ECR-3D TiO_2 NTAs−1.3 V after undergoing the PEC water splitting reaction for 180 min. The results obviously show that the morphology of the ECR-3D TiO_2 NTAs−1.3 V maintained intact and without observed structural degradation.

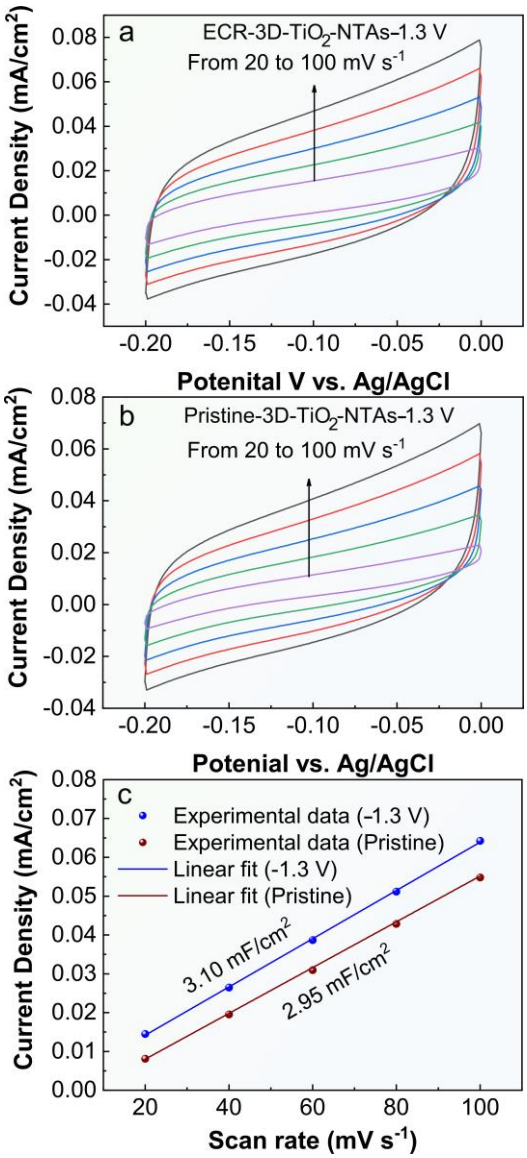


Figure S7. Cyclic voltammetry (CV) for (**a**) ECR-3D TiO_2 NTAs−1.3 V (**b**) Pristine-3D TiO_2 NTAs under different scan rates. (**c**) Relative electrochemical surface areas of the ECR-3D TiO_2 NTAs−1.3

V and Pristine-3D TiO_2 NTAs photoanodes: linear relationship between the capacitive current and scan rate.

Table S1. Comparison of the PEC performance for the self-doping TiO_2 NTAs on formed on Ti foil.

Photoanodes	Photocurrent density At 1.23 V(mA/cm^2)	Enhanced factors	References
Ti^{3+}-self-doped TiO_2 NTAs (2D)	0.52	3.1	[47]
P cation-doped TiO_2 NTAs (2D)	0.78	2.4	[51]
Ti^{3+}-self-doped TiO_2 NTAs (2D)	0.65	2.3	[48]
Reduced TiO_2 NTAs (2D)	0.73	3.0	[43]
Hydrogenated TiO_2 NTAs (2D)	2.1	2.0	[39]
Ti^{3+} self-doped TiO_2 NTAs (2D)	2.8	1.9	[46]
ECR-3D TiO_2 NTAs (3D)	1.6	4.0	This work

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