

ADVANCED MATERIALS

Supporting Information

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Designing Aligned Inorganic Nanotubes at the Electrode Interface: Towards
Highly Efficient Photovoltaic Wires

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Supporting Information

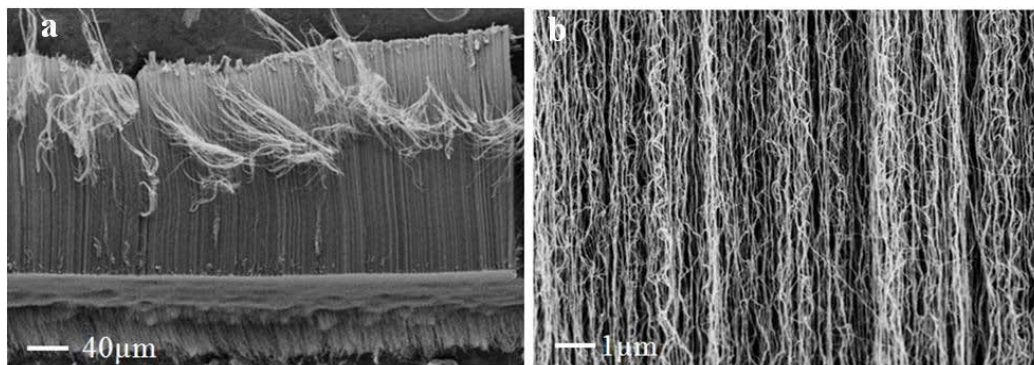


Figure S1. Scanning electron microscopy (SEM) images of a spinnable carbon nanotube (CNT) array at (a) low and (b) high magnifications by a side view.

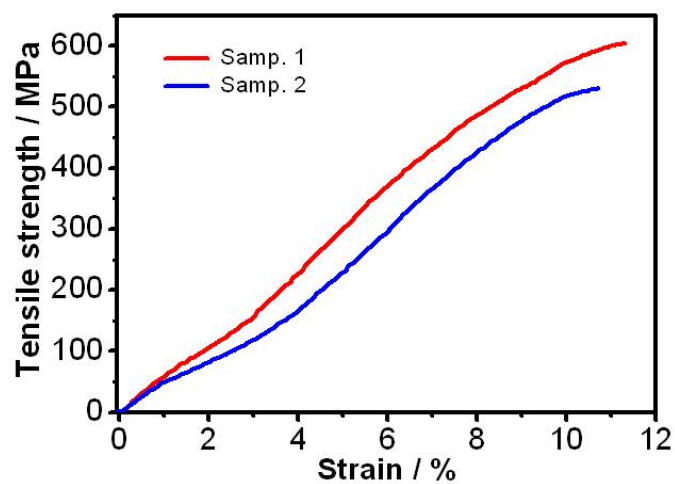


Figure S2. Stress–strain curves of two typical CNT fibers.

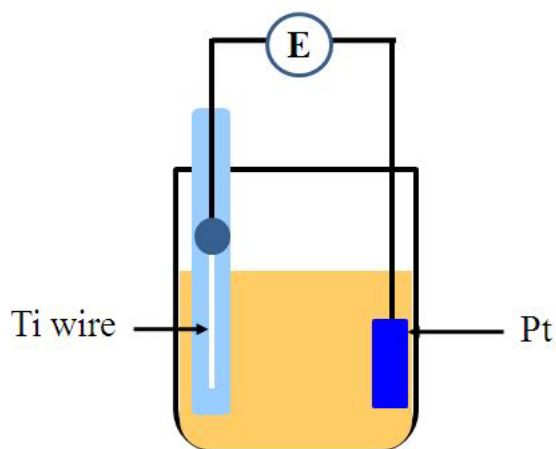


Figure S3. Experimental setup for the preparation of aligned TiO₂ nanotubes on a Ti wire in a NH₄F/H₂O/HOCH₂CH₂OH solution by anodic oxidation method.

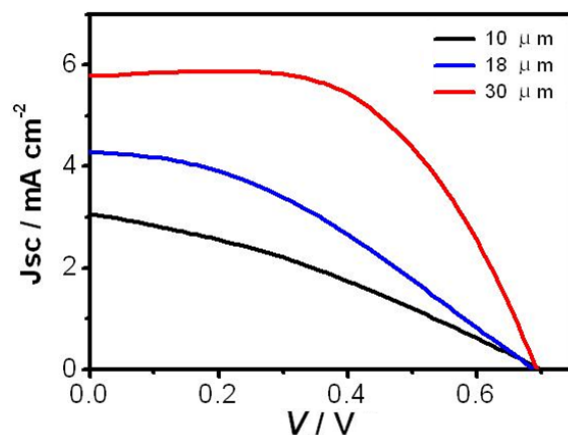


Figure S4. *J-V* curves of photovoltaic wires by using Ti wire after anodized for 2 h and different diameters of CNT fibers of 10, 18, and 30 μm , respectively.

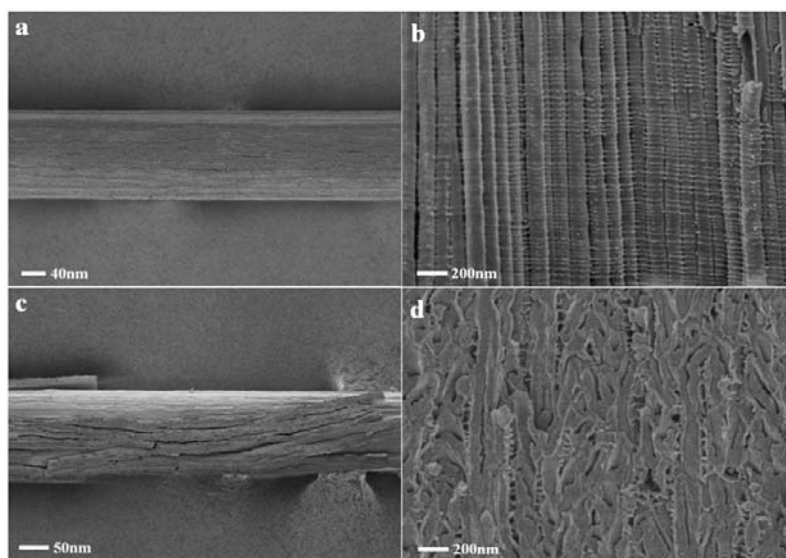


Figure S5. SEM images of TiO_2 nanotubes-modified titanium wires being anodized at 60 V for 2 h by using the electrolytes containing different water concentrations of (a) 0.5%, (b) 1%, (c) 1.5%, and (d) 2% by volume.

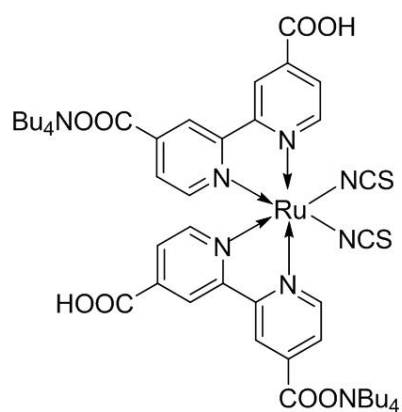


Figure S6. Chemical structure of N719.

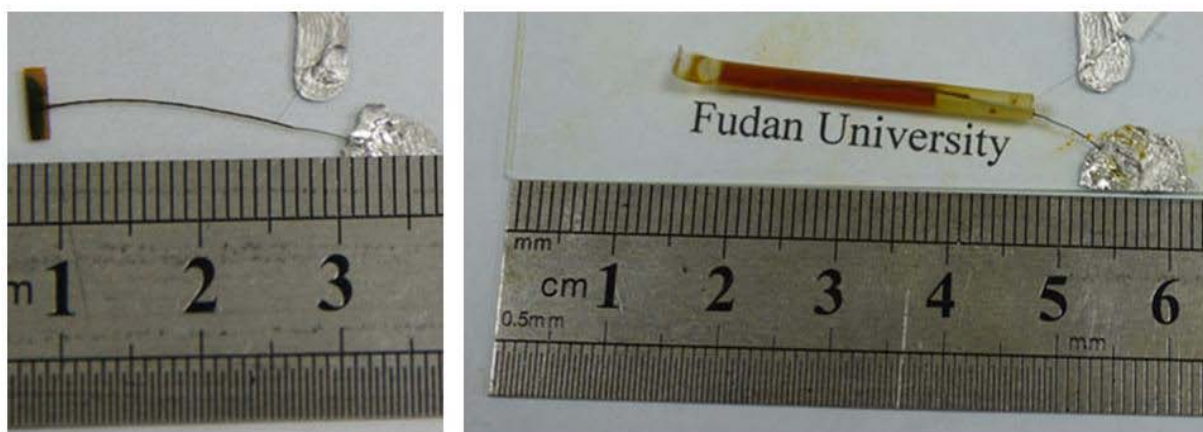


Figure S7. Photographs of a photovoltaic wire which was fabricated by twining a CNT fiber and a TiO₂ nanotube-modified titanium wire together.

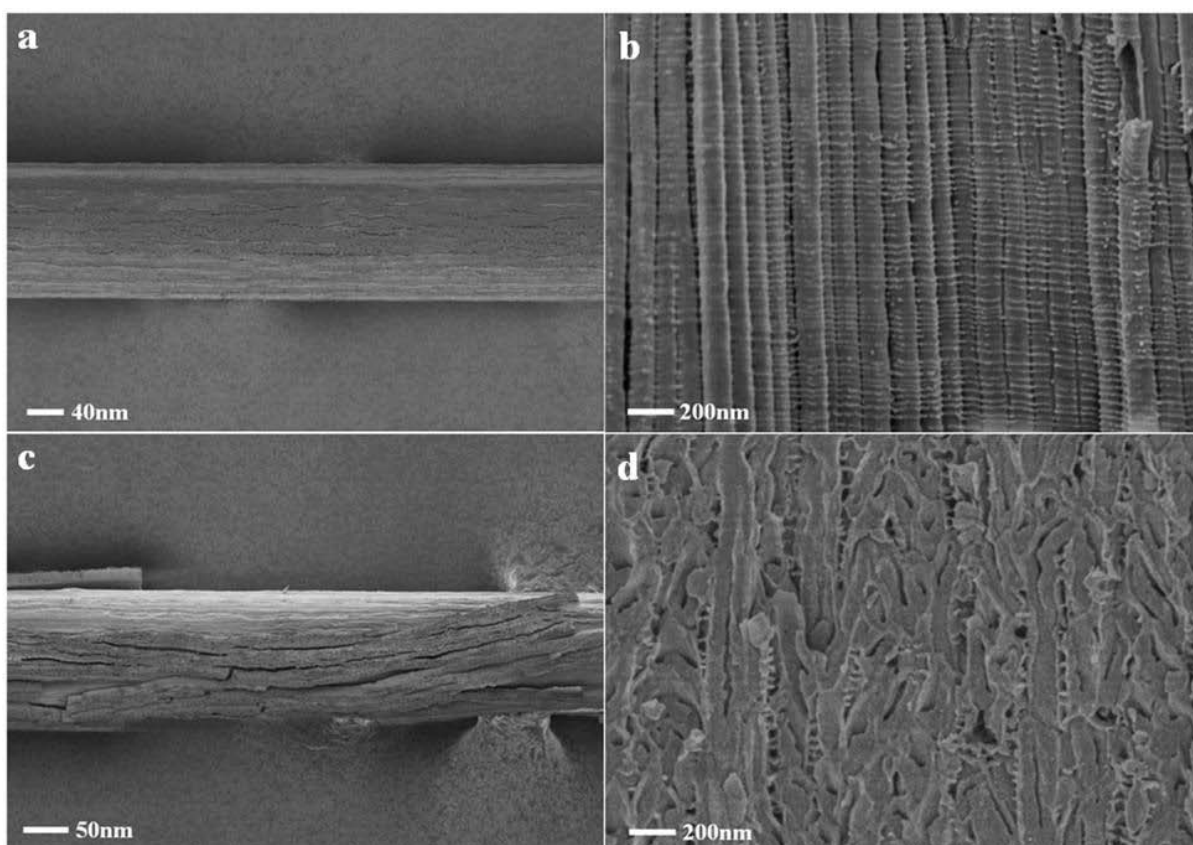


Figure S8. SEM images of TiO₂ nanotubes-modified titanium wires being anodized at different voltages of (a and b) 40V and (c and d) 80V using the electrolyte containing 1% H₂O by volume.

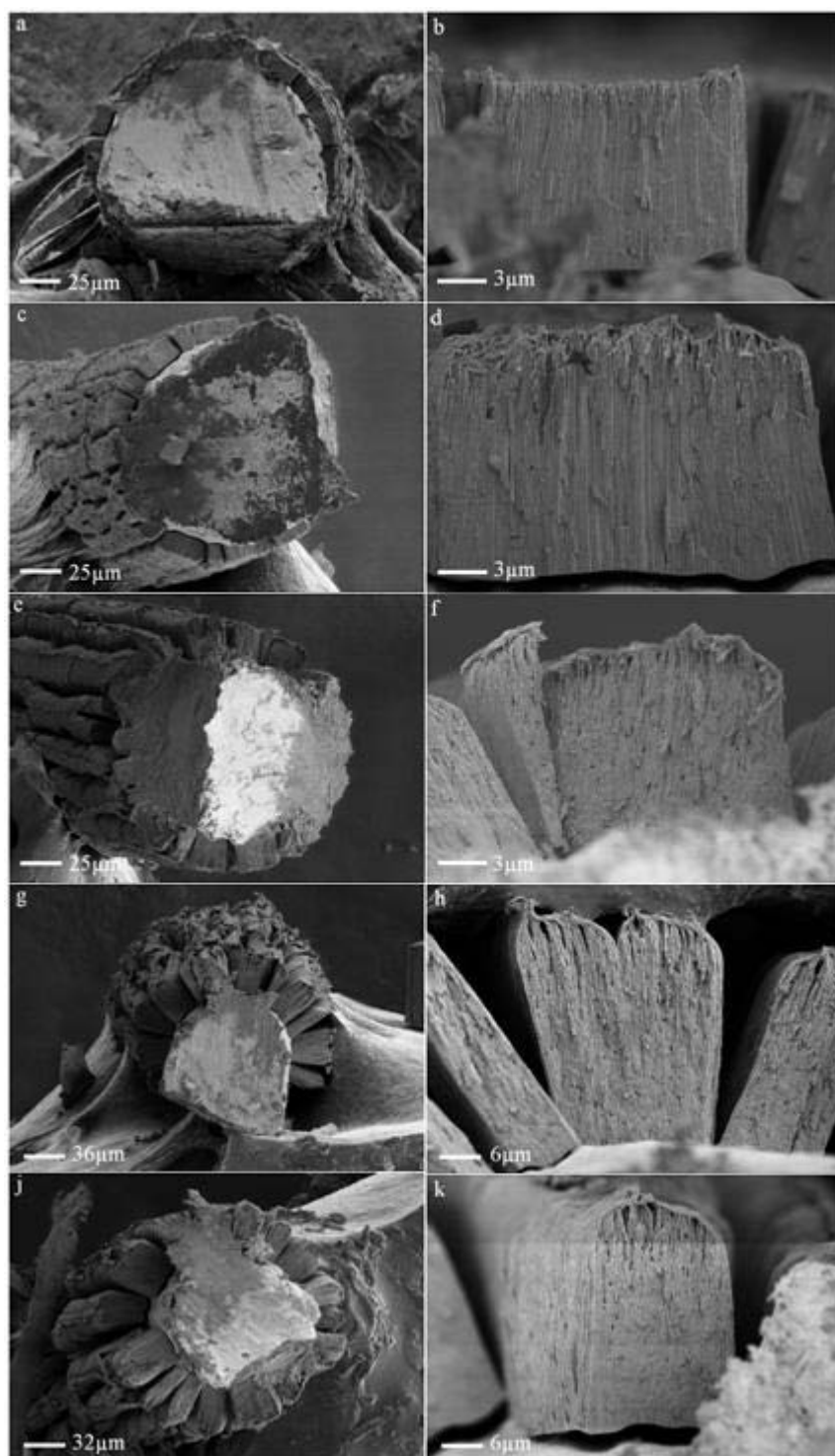


Figure S9. Cross-sectional SEM images of TiO₂ nanotube-modified wires being anodized at 60V in the electrolyte containing 1% of H₂O by volume with the increasing time of (a and b) 2h, (c and d) 4h, (e and f) 6h, (g and h) 8h, and (j and k) 10h.

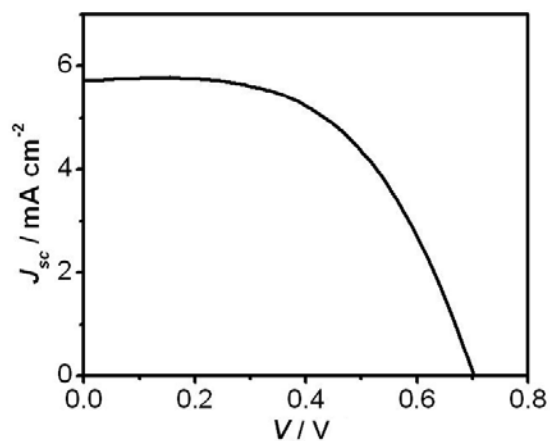


Figure S10. A typical J - V curve of wire cell by using the Ti wire after anodized for 2h.

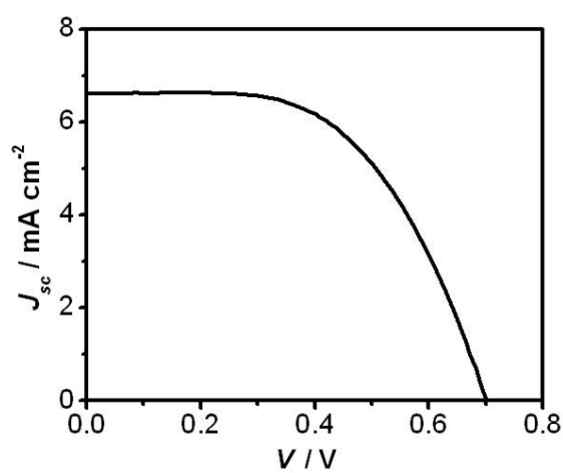


Figure S11. A typical J - V curve of wire cell by using the Ti wire after anodized for 4h.

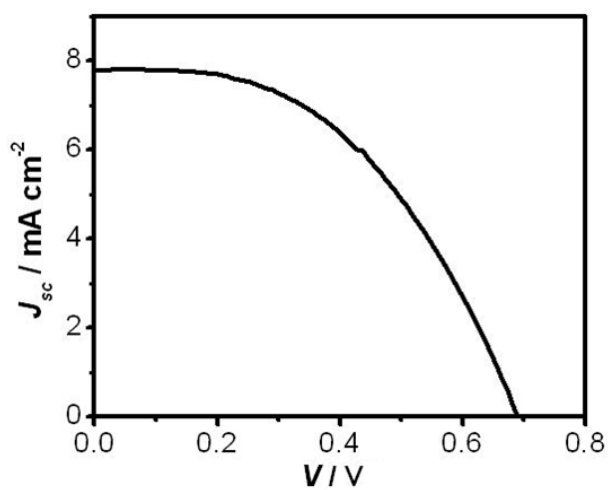


Figure S12. A typical J - V curve of wire cell by using the Ti wire after anodized for 6 h.

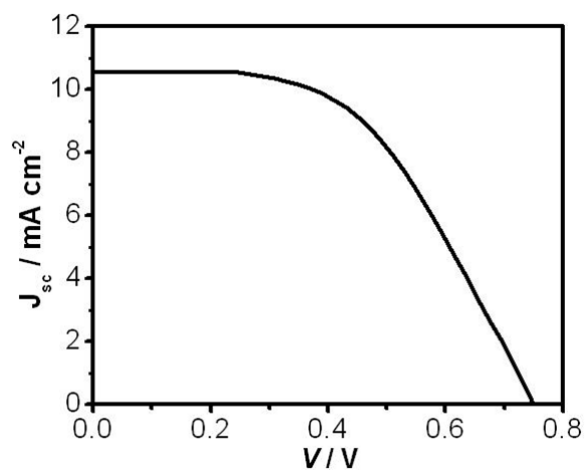


Figure S13. A typical J - V curve of wire cell by using the Ti wire after anodized for 8h.

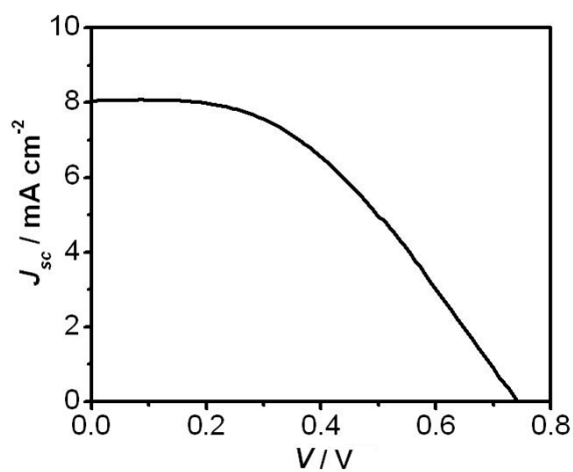


Figure S14. A typical J - V curve of wire cell by using the Ti wire after anodized for 10h.

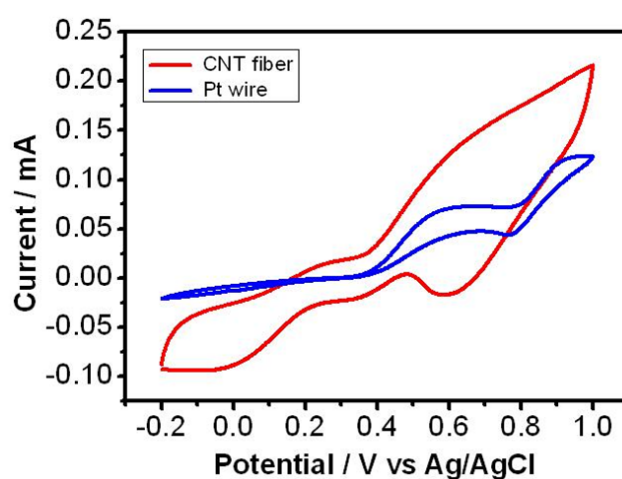


Figure S15. Cyclic voltammograms of a CNT fiber (red line) and Pt wire (blue line) at 100 mV s^{-1} in an acetonitrile solution containing 0.1 M LiClO_4 , 5 mM LiI , and 0.5 mM I_2 using a three-electrode system.

Table S1. Photovoltaic parameters by using the Ti wire after anodized for 2 h.

Length of TiO ₂ nanotubes (μm)	V_{oc} (V)	J_{sc} (mA cm ⁻²)	FF	η (%)
11	0.72	5.36	0.56	2.18
11	0.69	5.78	0.56	2.25
11	0.70	5.71	0.55	2.20

Table S2. Photovoltaic parameters by using the Ti wire after anodized for 4 h.

Length of TiO ₂ nanotubes (μm)	V_{oc} (V)	J_{sc} (mA cm ⁻²)	FF	η (%)
15	0.71	6.99	0.51	2.54
15	0.70	6.60	0.56	2.60
15	0.70	5.84	0.53	2.21

Table S3. Photovoltaic parameters by using the Ti wire after anodized for 6 h.

Length of TiO ₂ nanotubes (μm)	V_{oc} (V)	J_{sc} (mA cm ⁻²)	FF	η (%)
22	0.69	8.20	0.48	2.73
22	0.69	7.76	0.48	2.59
22	0.69	9.45	0.44	2.88

Table S4. Photovoltaic parameters by using the Ti wire after anodized for 8 h.

Length of TiO ₂ nanotubes (μm)	V_{oc} (V)	J_{sc} (mA cm ⁻²)	FF	η (%)
34	0.70	9.27	0.53	3.42
34	0.74	9.25	0.57	3.89
34	0.69	9.84	0.57	3.90

Table S5. Photovoltaic parameters by using the Ti wire after anodized for 10 h.

Length of TiO ₂ nanotubes (μm)	V_{oc} (V)	J_{sc} (mA cm ⁻²)	FF	η (%)
40	0.74	8.04	0.44	2.64
40	0.72	8.22	0.46	2.72
40	0.71	6.14	0.54	2.36