

## Supporting Information

### Ultralong Rutile TiO<sub>2</sub> Nanowire Arrays for Highly Efficient Dye-Sensitized Solar Cells

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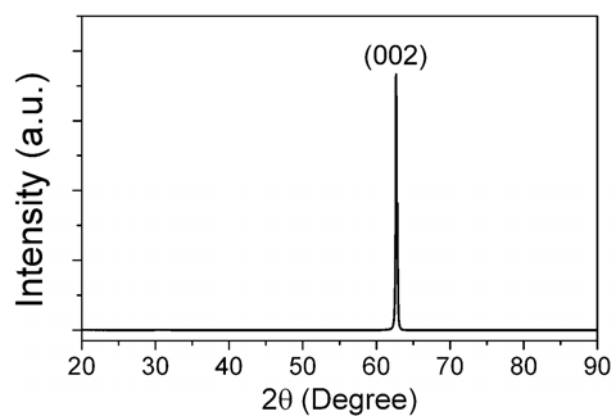
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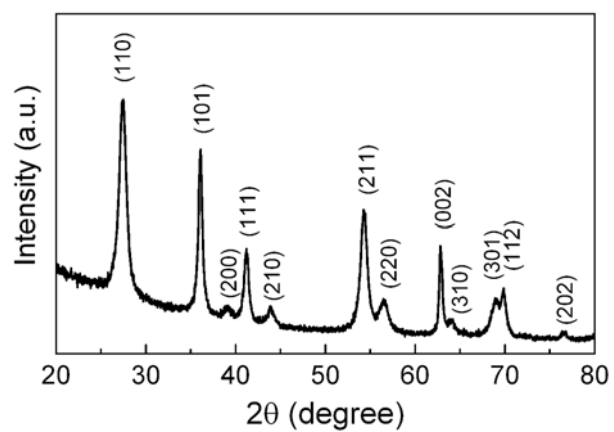
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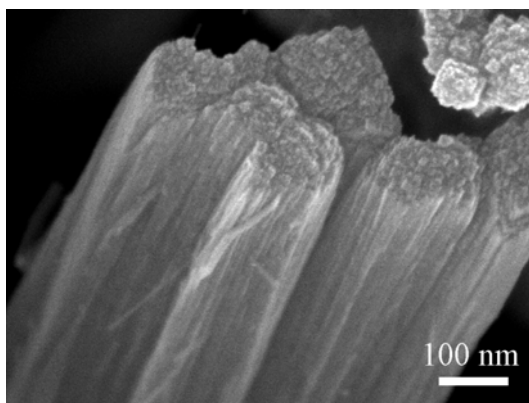
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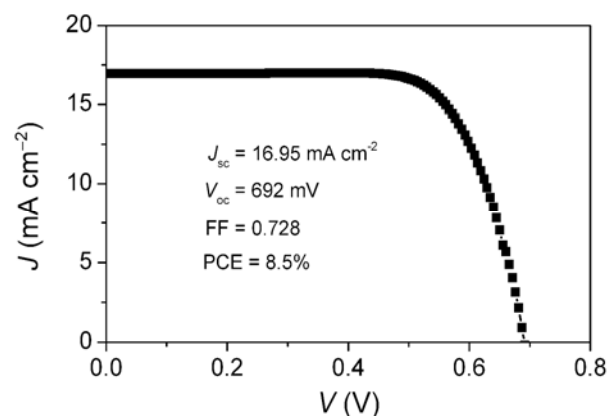
**Figure S1.** XRD patterns of TiO<sub>2</sub> NWAs prepared in the solution with 3 mL of TiCl<sub>4</sub>, 20 mL of ethanol, 10 mL of DI water, and 30 mL of concentrated HCl at 150 °C for 12 h.



**Figure S2.** XRD patterns of TiO<sub>2</sub> NWs as a powder form that can be prepared by grinding the TiO<sub>2</sub> NWAs grown in the solution with 3 mL of TiCl<sub>4</sub>, 20 mL of ethanol, 10 mL of DI water, and 30 mL of concentrated HCl at 150 °C for 12 h.



**Figure S3.** FESEM image of broken  $\text{TiO}_2$  NWAs prepared in the solution with 3 mL of  $\text{TiCl}_4$ , 30 mL of DI water, and 30 mL of concentrated HCl at 150 °C for 12 h.



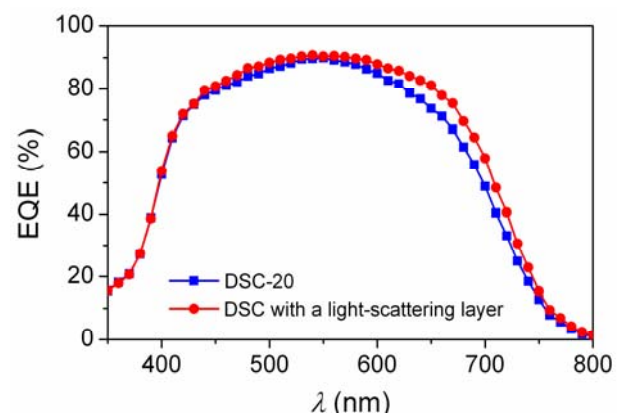
**Figure S4.**  $J$ – $V$  characteristics of the DSC based on the N719-sensitized  $\text{TiO}_2$  NWAs prepared in the reaction solution with 20 mL of ethanol.

**Table S1. Detailed simulative values of recombination resistance ( $R_2$ ) and electron lifetime ( $\tau_r$ ) values from EIS spectra.**

DSCs	$R_2$ (ohm)	$\tau_r$ (s)
DSC-0	616.2	0.461
DSC-10	247.6	0.331
DSC-20	199.3	0.315
DSC-30	143.5	0.298

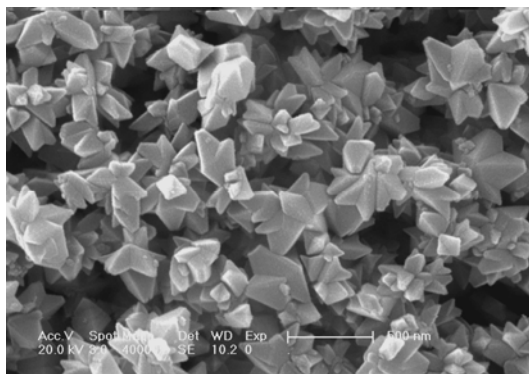
**Table S2. Detailed photovoltaic and simulative EIS parameters of DSCs based on TiO<sub>2</sub> NWAs prepared in the solution with 3 mL of TiCl<sub>4</sub>, 20 mL of ethanol, 10 mL of DI water, and 30 mL of concentrated HCl at 150 °C for different reaction times.**

Reaction time (h)	Film thickness (μm)	$J_{sc}$ (mA cm <sup>-2</sup> )	$V_{oc}$ (mV)	FF	PCE (%)	Dye loading (nmol cm <sup>-2</sup> )	$R_2$ (ohm)	$\tau_r$ (s)	$L_n$ (μm)
1	7	5.39	712	0.740	2.8	27.2	242.9	0.328	134.7
3	26	13.37	698	0.738	6.9	151.6	221.7	0.321	122.8
9	32	16.12	690	0.742	8.2	352.5	207.5	0.317	110.2
12	44	17.38	687	0.747	8.9	426.4	199.3	0.315	102.3



**Figure S5.** EQE spectra of the DSC-20 and DSC with a light-scattering layer.





**Figure S6.** FESEM image of the light-scattering particles.