Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information for

Highly ordered hierarchical TiO_2 nanotube arrays for flexible fiber-type dye-sensitized solar cells

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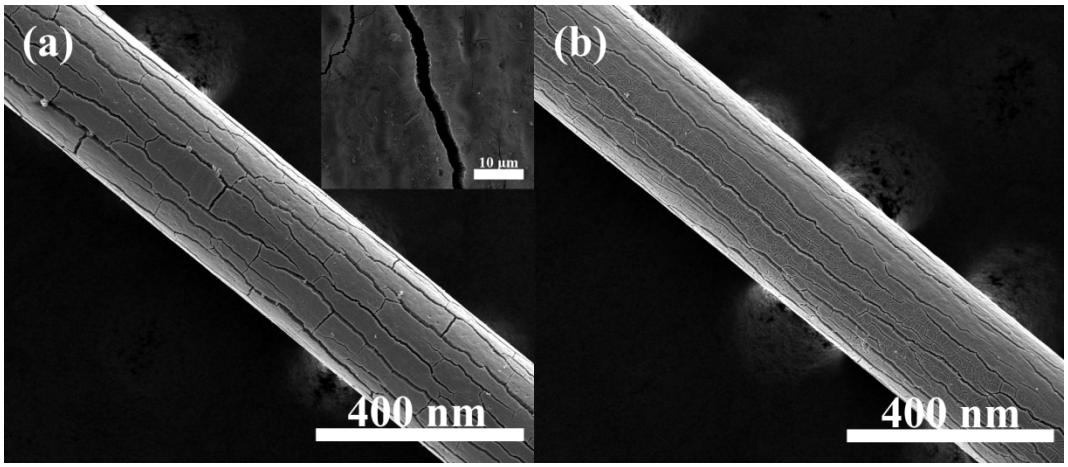

Figure S1 Side view SEM images of Ti microwires covered with smooth TiO_2 nanotube arrays (STNT, a) and hierarchical TiO_2 nanotube array (HTNT, b); the inset in Figure S1a is the top-view SEM image of the STNT under low magnification, which contains some cracks on the surface.

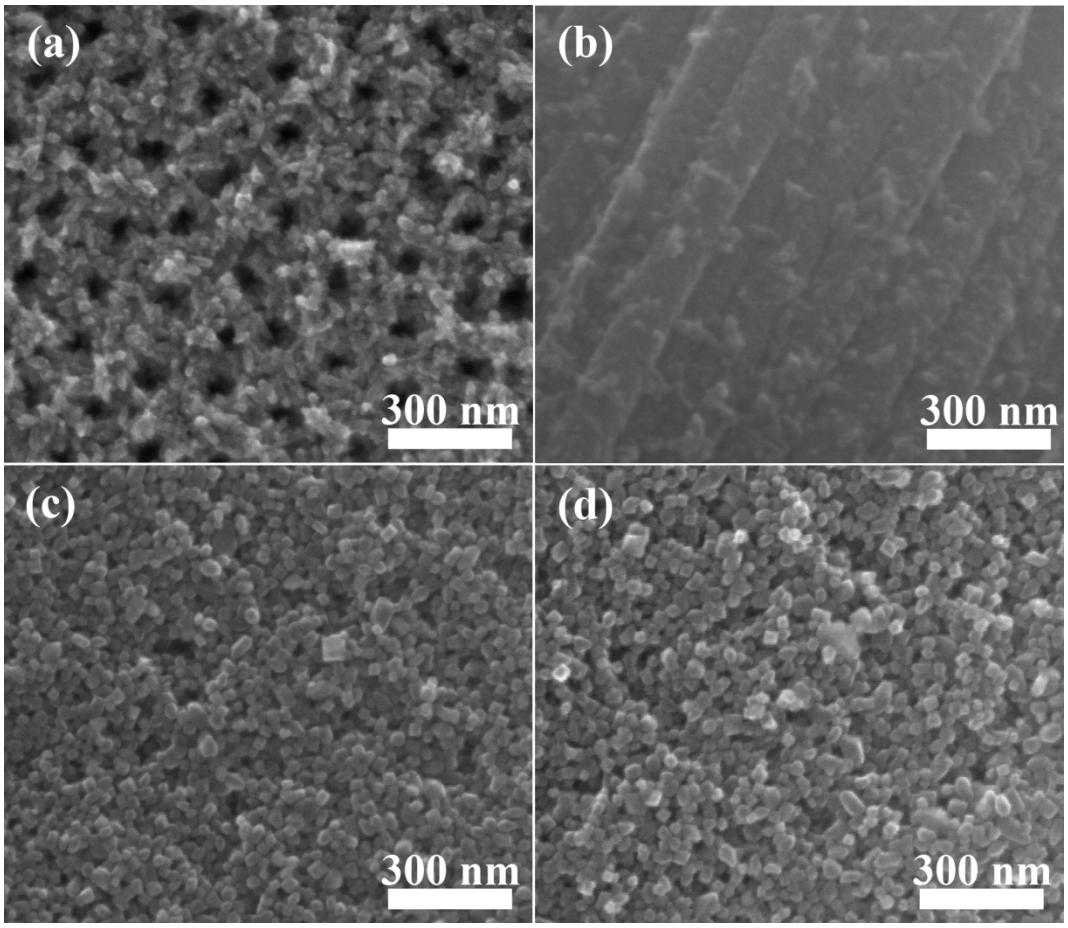

Figure S2 Top-view and side-view SEM images of hierarchical TiO_2 nanotube array obtained from the NH_4F solution at 200 ºC for 5h (a, b) and 15h (c, d).

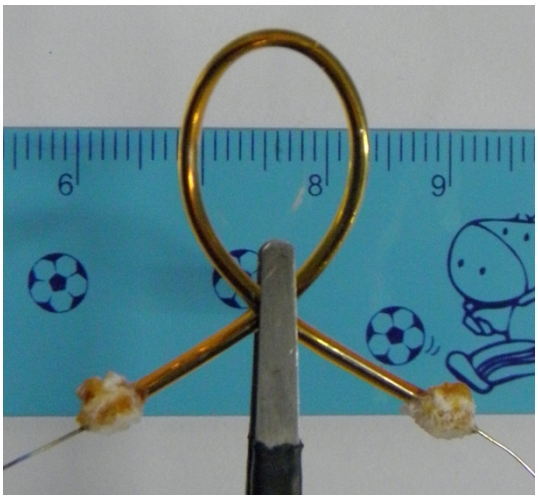

Figure S3 Digital photograph of a flexible fiber-type DSSC in bending state.

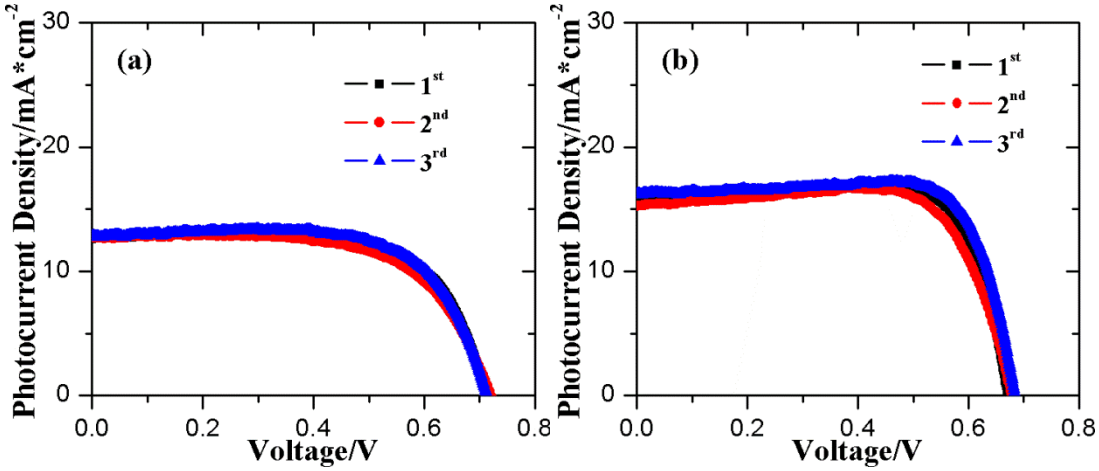

Figure S4 *J-V* curves of three individual flexible fiber-type DSSCs based on STNT (a) and HTNT (b) arrays. The corresponding performance parameters are summarized in Table S1.

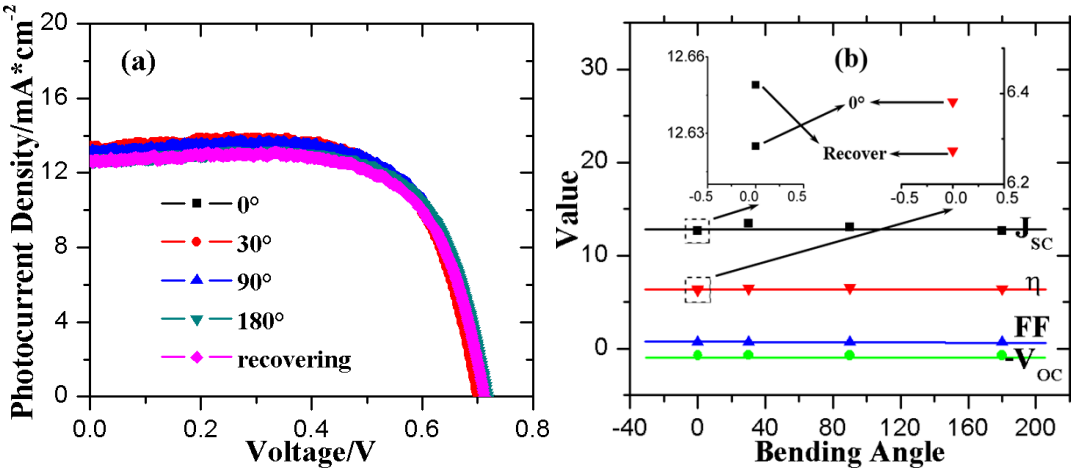

Figure S5 (a) *J-V* plots; (b) photovoltaic parameters of a 1.6 cm long flexible fiber-type DSSC based on a STNT array under different bending angles.

Table S1 Performance parameters of three individual flexible fiber-type DSSCs based on STNT or HTNT arrays.

Photoanodes		J_{SC}/mA cm^{-2}	V_{OC}/V	FF	η/%
STNT	1st	12.6	0.71	0.71	6.4
	2nd	12.7	0.72	0.65	5.9
	3rd	12.8	0.71	0.70	6.4
HTNT	1st	15.9	0.67	0.80	8.6
	2nd	15.3	0.68	0.78	8.1
	3rd	15.9	0.68	0.81	8.8

Table S2 Performance parameters of a 1.7 cm long flexible fiber-type DSSC based on the HTNT array under different bending angles

Bending Angles	J_{SC}/mA cm^{-2}	V_{OC}/V	FF	η/%
0°	15.9	0.67	0.80	8.6
30°	15.7	0.68	0.79	8.5
90°	16.0	0.68	0.81	8.8
180°	15.5	0.69	0.81	8.6
Recover	15.6	0.68	0.80	8.6

Table S3 Performance parameters of a 1.6 cm long flexible fiber-type DSSC based on the STNT array under different bending angles

Bending Angles	J_{SC}/mA cm^{-2}	V_{OC}/V	FF	η/%
0°	12.6	0.71	0.71	6.4
30°	13.5	0.70	0.69	6.5
90°	13.1	0.72	0.70	6.6
180°	12.7	0.72	0.71	6.4
Recover	12.6	0.71	0.70	6.3

Table S4 Performance parameters of the flexible fiber-type DSSC based on HTNT arrays under different bending times when θ=90º.

Bending Times	J_{SC}/mA cm^{-2}	V_{OC}/V	FF	η/%
Pristine	15.9	0.67	0.80	8.6
100	15.0	0.68	0.82	8.4
500	14.2	0.67	0.81	7.7