Integrated Power Fiber for Energy Conversion and Storage System†

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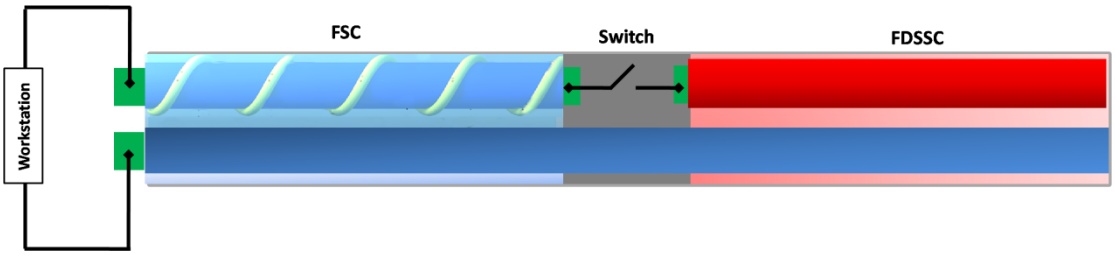

Figure S1. The structural schematic diagram of an integrated power fiber, shows the detail wires connection of an integrated unit in the test

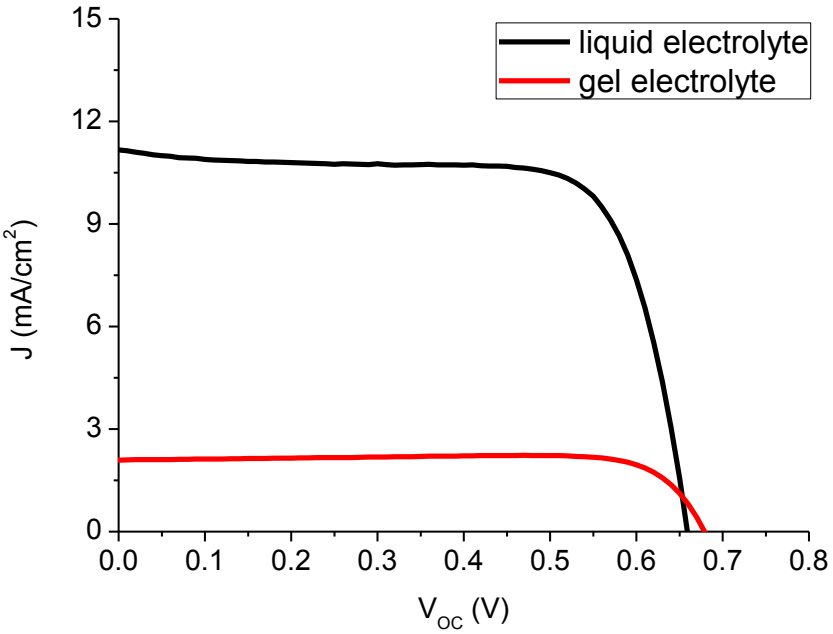

Figure S2. The *J-V* curves of FDSSCs with gel electrolyte and liquid electrolyte. The gel electrolyte contains 0.6 M 1-butyl-3-methylimidazolium iodide, 0.025M iodine, 0.3 M 4-tert-butylpyridine, 0.05 M

lithium perchlorate ,0.05 M guanidine thiocyanate and 1.0g/mL polyethylene oxide (PEO, Mr=10000) in acetonitrile solution. The photovoltaic parameters are summarized in the Table S1.

Table S1. The photovoltaic parameters of FDSSCs with liquid electrolyte and gel electrolyte

Electrolyte	V_{oc} (V)	J_{sc} (mA/cm^2)	FF	PCE (%)
Liquid	0.59	11.2	0.736	5.41
Gel	0.679	2.1	0.817	1.21

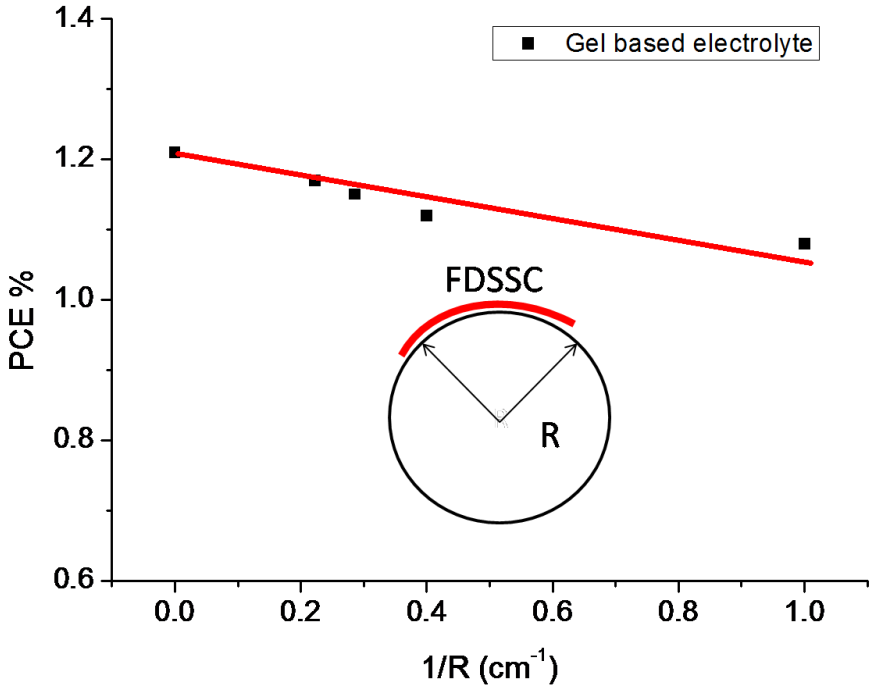

Figure S3. The relationship between PCE% of gel electrolyte based FSSCs and bending curvatures (1/R), where R is the bending radius. The reason for slight decline of efficiency might be the damage of TiO_2 film in the bending process.

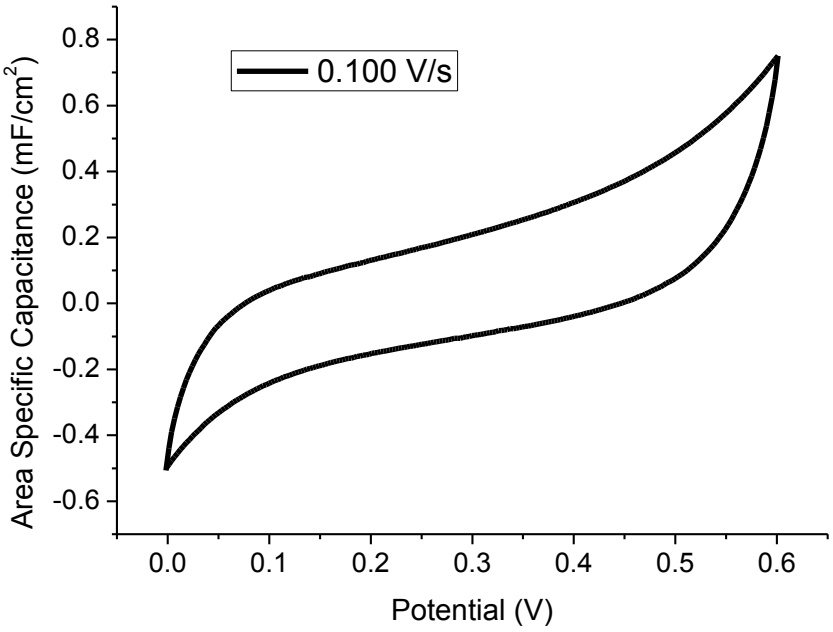

Figure S4. Cyclic voltammetry (CV) curves of fiber supercapacitors using bare SS electrodes at a scan rate 0.100V/s

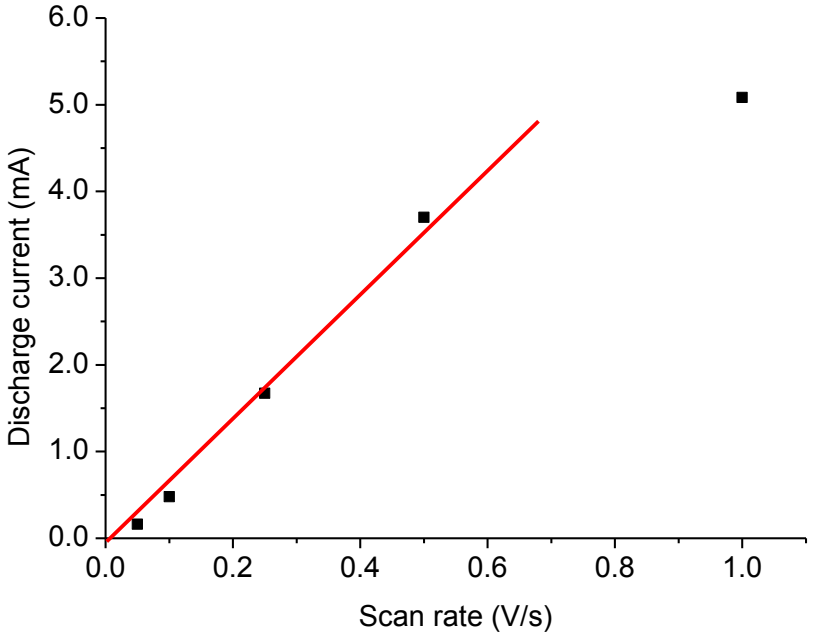

Figure S5. The discharge current versus the scan rate shows the linear range reaching 0.5 V/s.

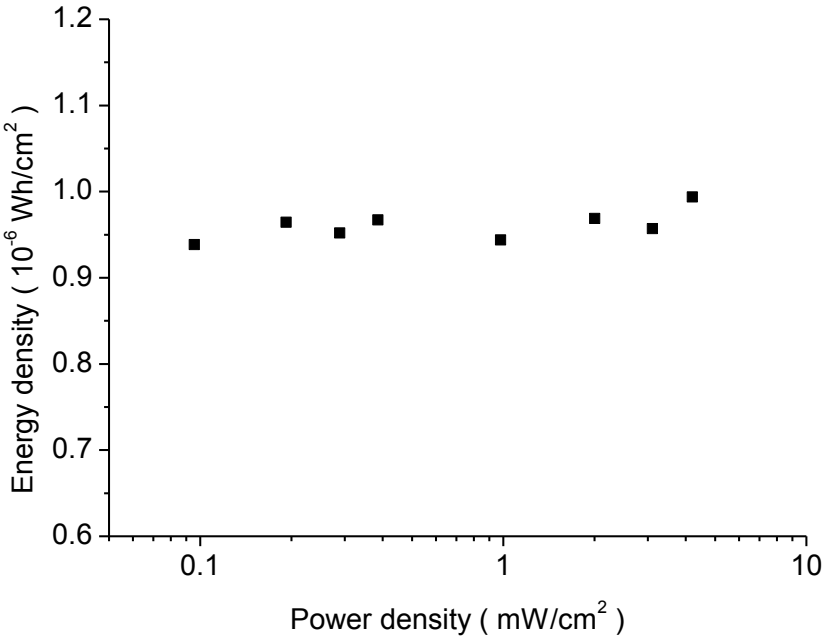

Figure S6. Ragone plot of fiber supercapacitor

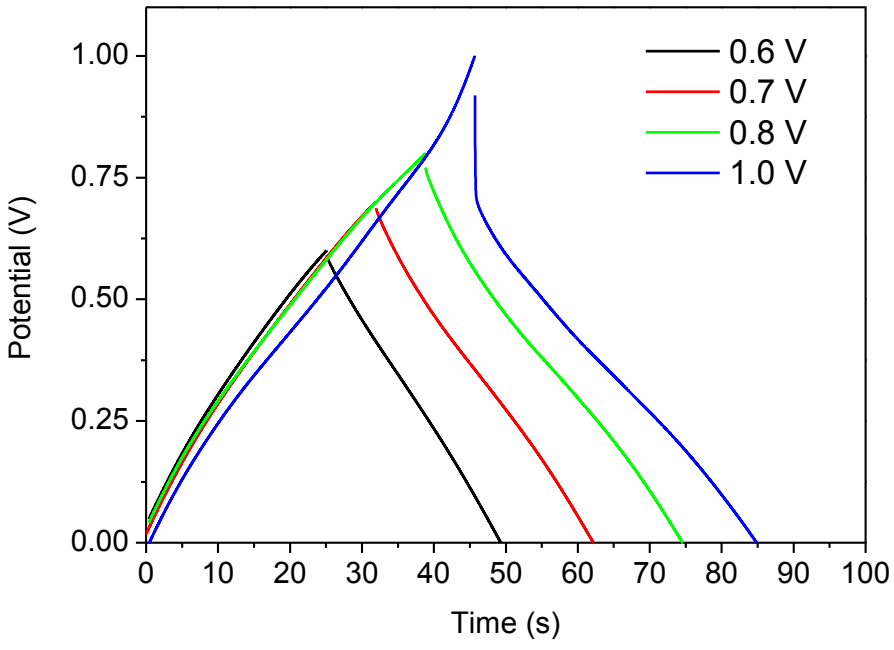

Figure S7. The galvanostatic charge/discharge curves of FSC with different operational voltage windows

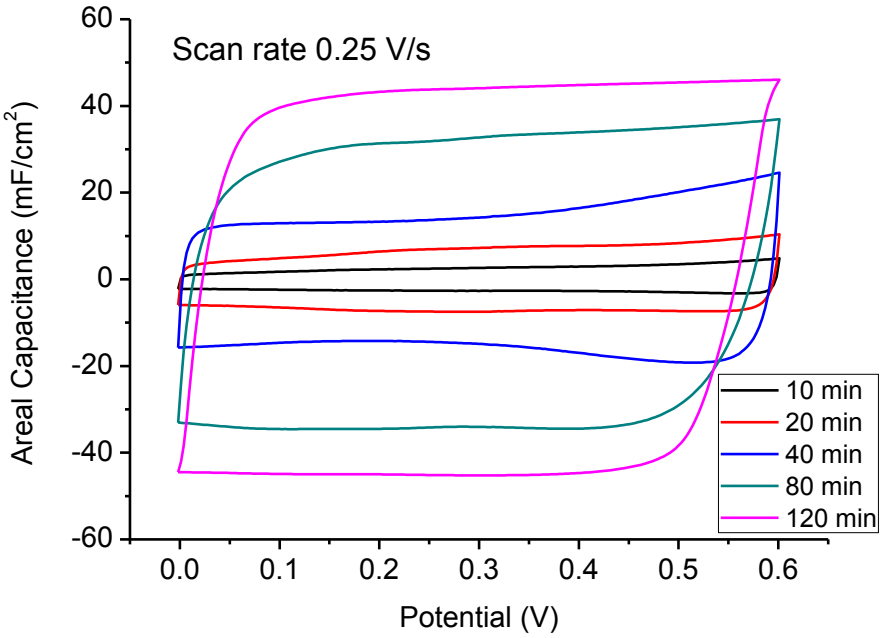

Figure S8. Cyclic voltammetry (CV) curves of fiber supercapacitors using PANi-SS electrodes with different electrolytic deposition time at a scan rate 0.25V/s

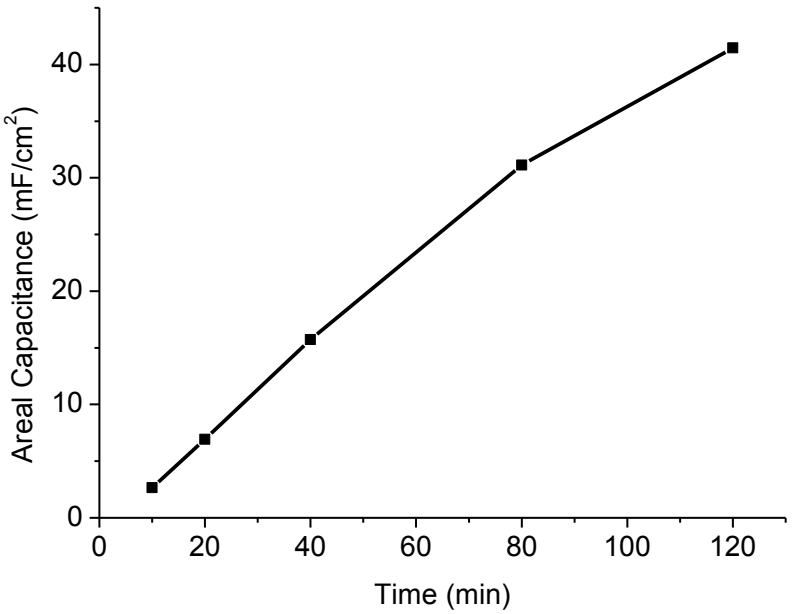

Figure S9. The areal specific capacitance versus anodic deposition time

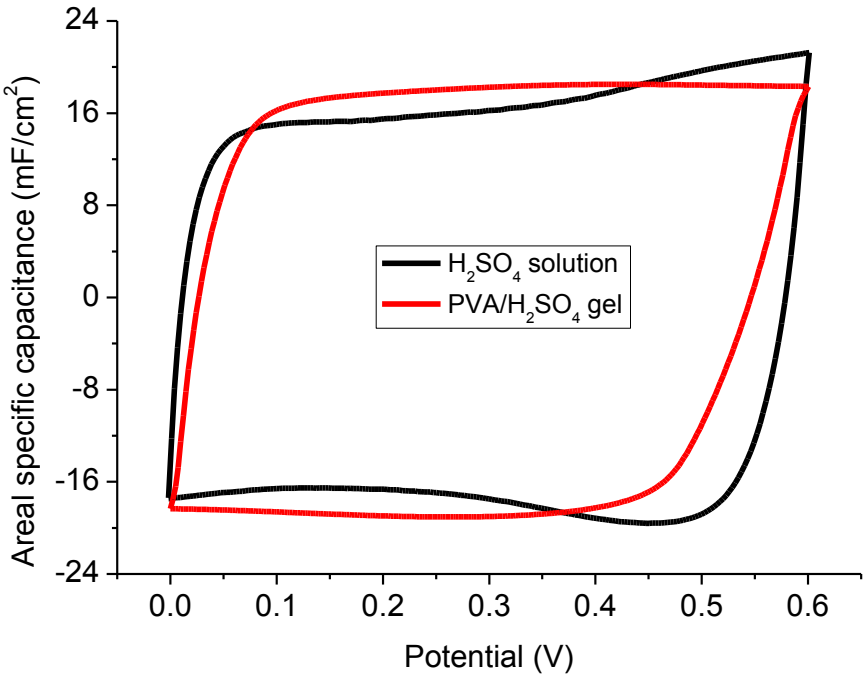

Figure S10. The CV curves of FSC with H_2SO_4 solution and PVA/H_2SO_4 gel as the electrolytes

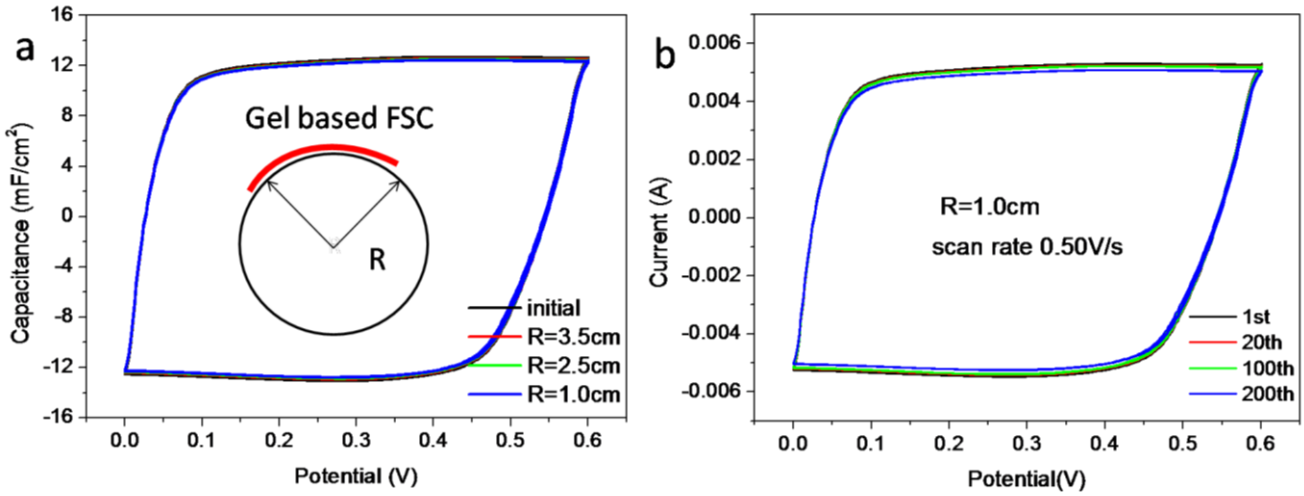

Figure S11. The CV curves of gel based FSC under different bent radius and bending cycles, demonstrating good flexibility. The scan rate is 0.50V/s.

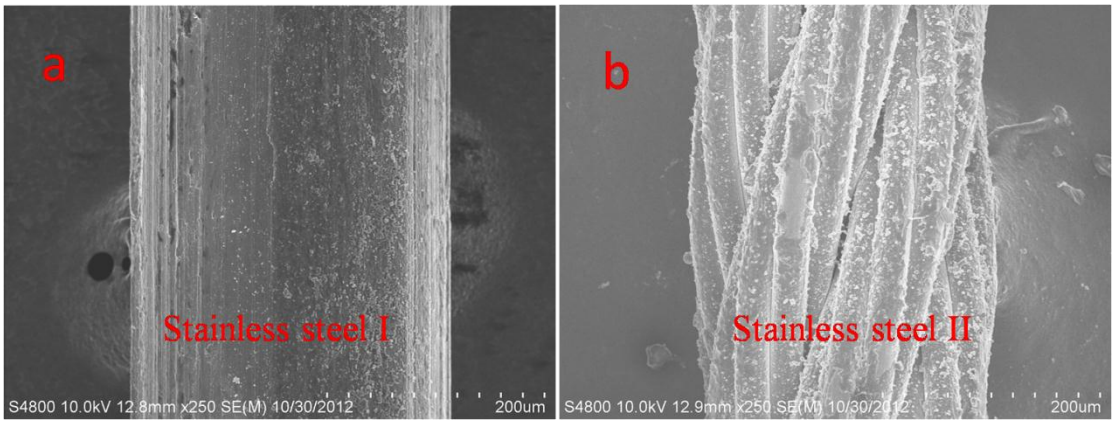

Figure S12. The SEM images of stainless steel I and stainless steel II. The former is ordinary stainless steel, while the later is made of several threads of finer stainless steel I.

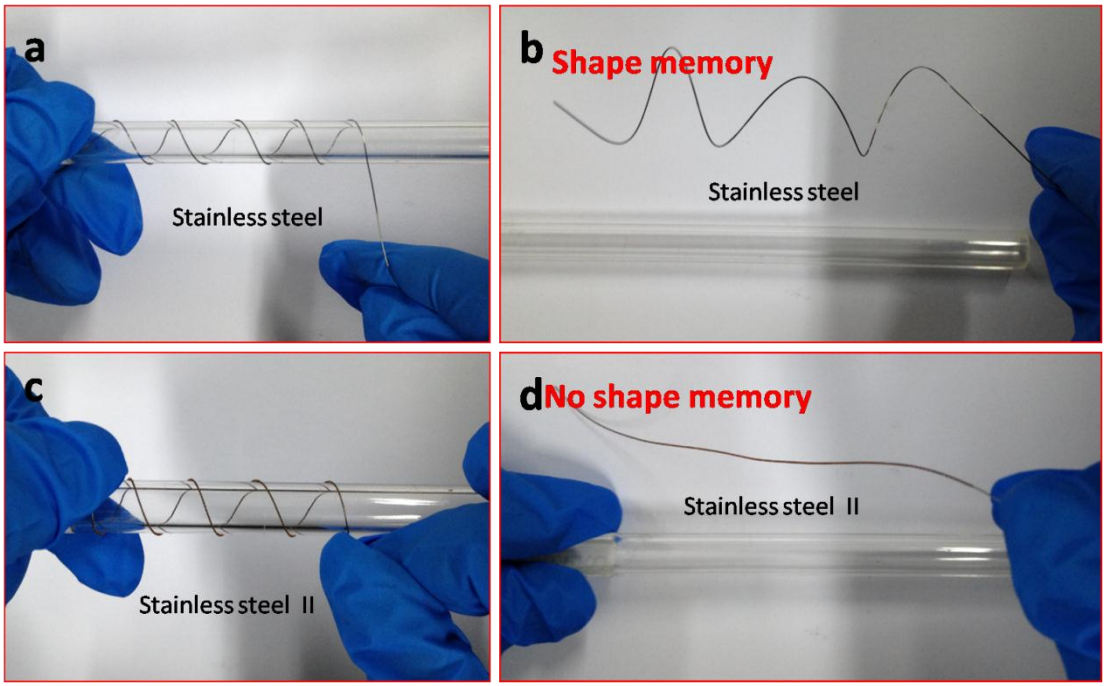

Figure S13. The photos show that stainless steel I has shape memory and stainless steel has the ability to recover.

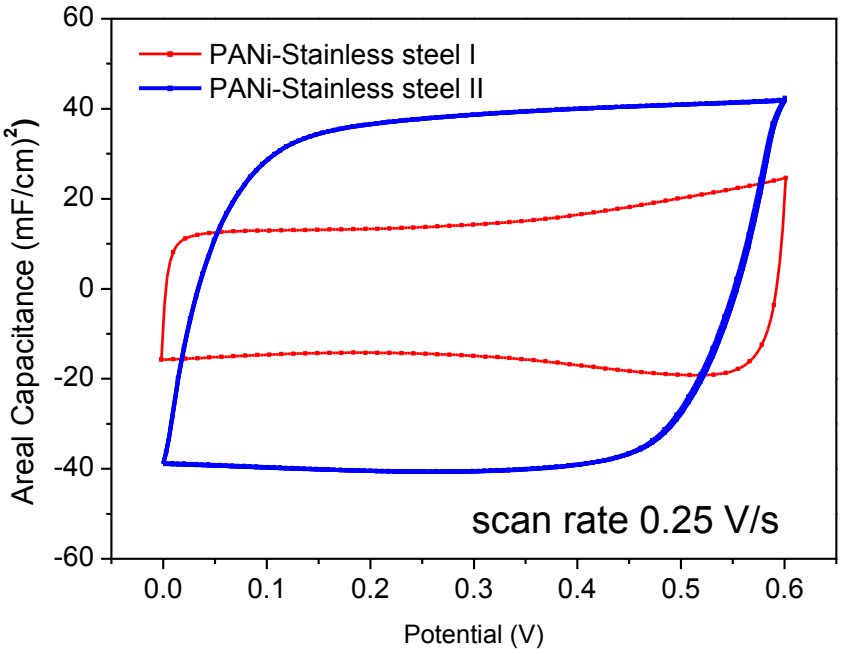

Figure S14. The CV curves of FSCs using PANi-SS I and PANi-SS II as the electrodes. The later shows much higher capacitance, due to its larger surface area.

Table S2. Summary of some parameters of integrated power fiber during the solar-charging process

Photocharging time T (s)	Voltage of FSC V (V)	Energy storage in FSC (E_{FSC})(mJ)	Illuminating light energy on FDSSC E_{Light} (mJ)	Overall energy conversion $\eta_{overall}$
0	0	0	0	0
1.00	0.0918	0.1116	19.0	0.59
2.00	0.1607	0.3417	38.0	0.90
3.00	0.2228	0.6568	57.0	1.15
4.00	0.2801	1.0377	76.0	1.37
5.00	0.3328	1.4651	95.0	1.54
6.00	0.3817	1.9281	114.0	1.69
7.00	0.4285	2.4297	133.0	1.83
8.00	0.4737	2.9684	152.0	1.95
9.00	0.5158	3.5194	171.0	2.06
10.00	0.5515	4.0235	190.0	2.12
10.51*	0.5661	4.2401	199.7	2.12
11.00	0.5777	4.4156	209.0	2.11
12.00	0.5945	4.6759	228.0	2.05
13.00	0.6046	4.8357	247.0	1.96
14.00	0.6104	4.9289	266.0	1.85
15.00	0.6127	4.9832	285.0	1.75
16.00	0.6162	5.0230	304.0	1.65
17.00	0.6174	5.0429	323.0	1.56
18.00	0.6186	5.0629	342.0	1.48
19.00	0.6192	5.0729	361.0	1.41
20.00	0.6198	5.0828	380.0	1.34
21.00	0.6201	5.0879	399.0	1.28
22.00	0.6204	5.0929	418.0	1.22
23.00	0.6207	5.0979	437.0	1.17
24.00	0.621	5.1029	456.0	1.12

Note: the C_{FSC} is 26.46 mF, the P_{in} is 100.0 mW/cm^2 and the A_{FDSSC} is 0.190 cm^2. * is the maximum overall energy conversion. $E_{FSC} = 1/2C_{FSC}V^2$ (mJ), $E_{Light} = P_{in} \times A_{FDSSC} \times t$, $\eta_{overall} = E_{FSC}/ E_{Light}$