Supplementary Information for

A High Performance Wire-Shaped Flexible Lithium-Ion Battery Based on Silicon Nanoparticles within Polypyrrole/Twisted Carbon Fibers

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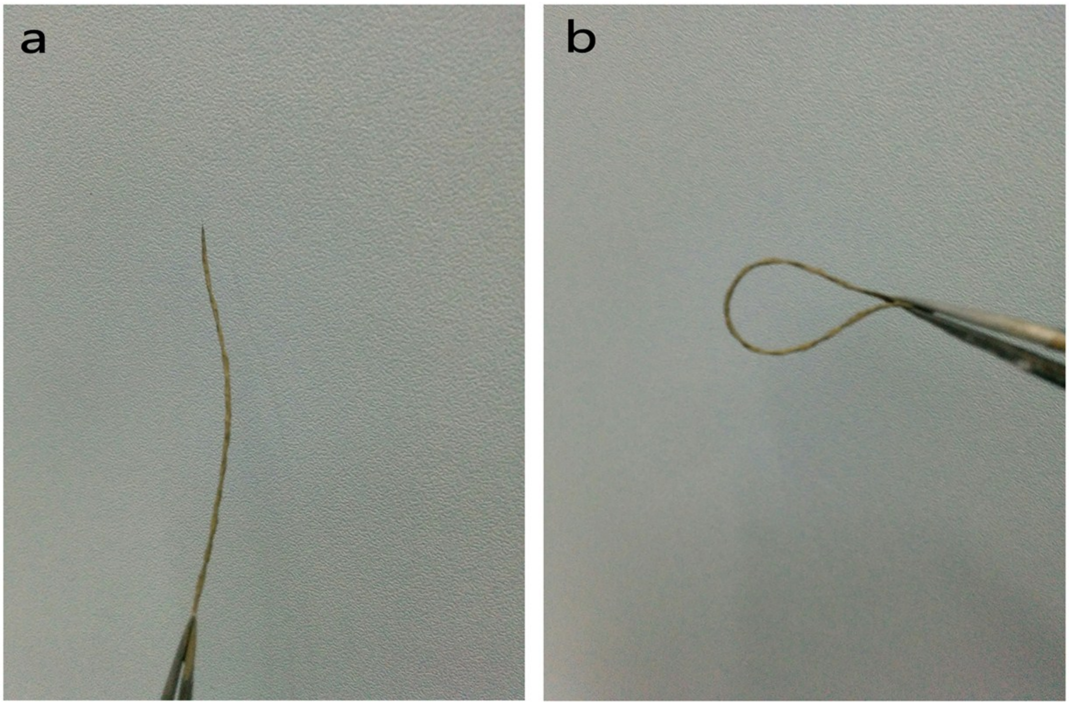

Figure S1. The flexibility of the Si/PPy/CFs.

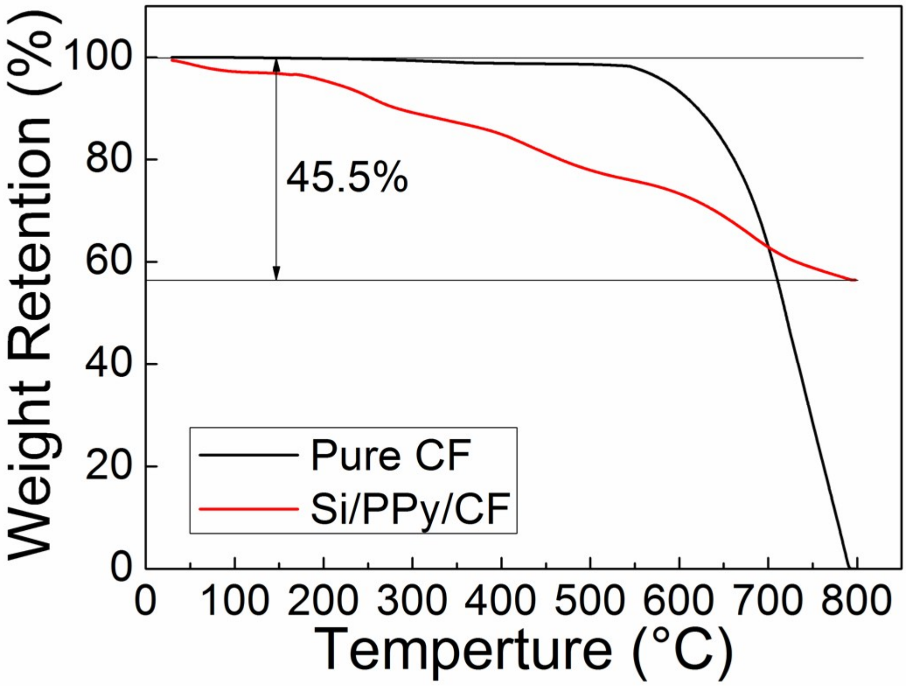

Figure S2. Thermogravimetric analysis of pure CF and Si/PPy/CFs in air.

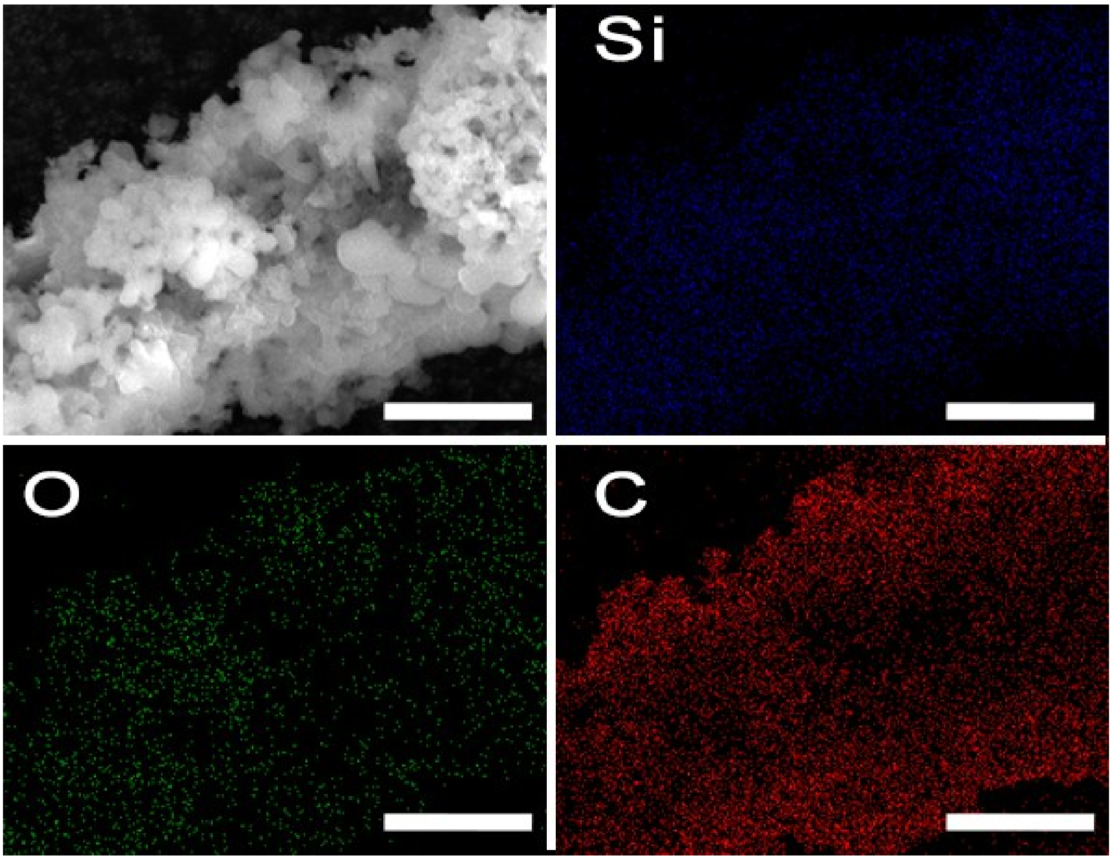

Figure S3.The Mapping images for Si/PPy/CFs. The C and Si elements were well dispersed, indicating the good interconnection in the Si/PPy/CFs electrode. The scale bar is 10 μm

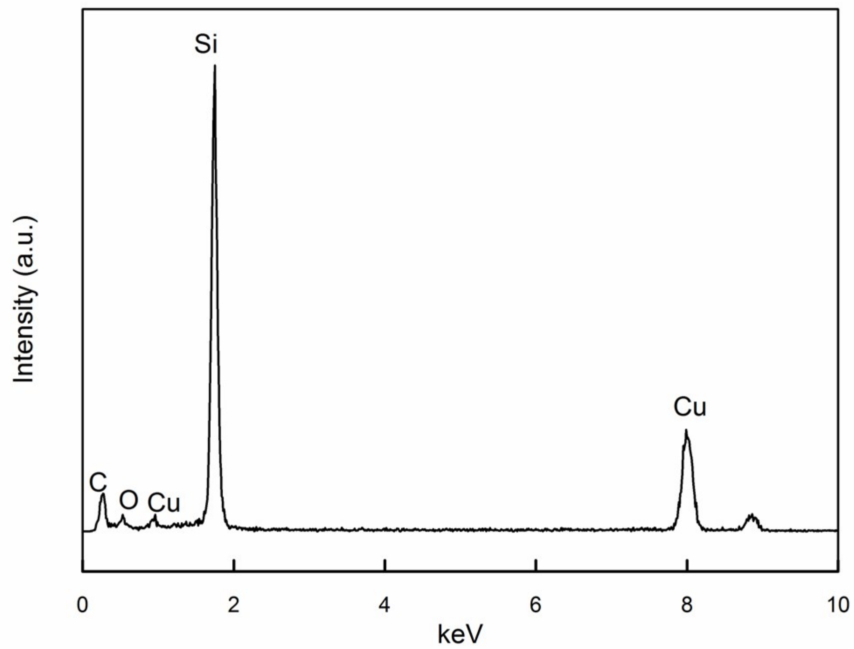

Figure S4. The EDAX pattern for Si/PPy/CFs composite.

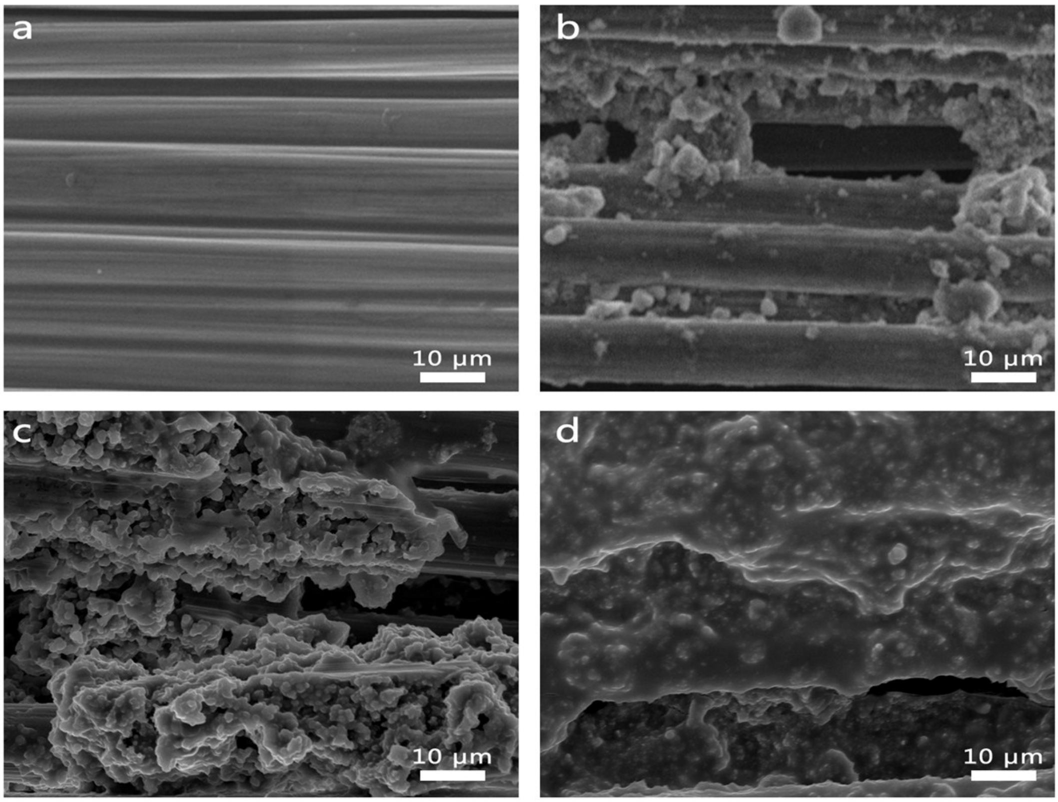

Figure S5. The SEM images of the Si/PPy/CFs with various PPy deposition time at 0s (a), 300s (b), 900s (c) and 1100s (d).

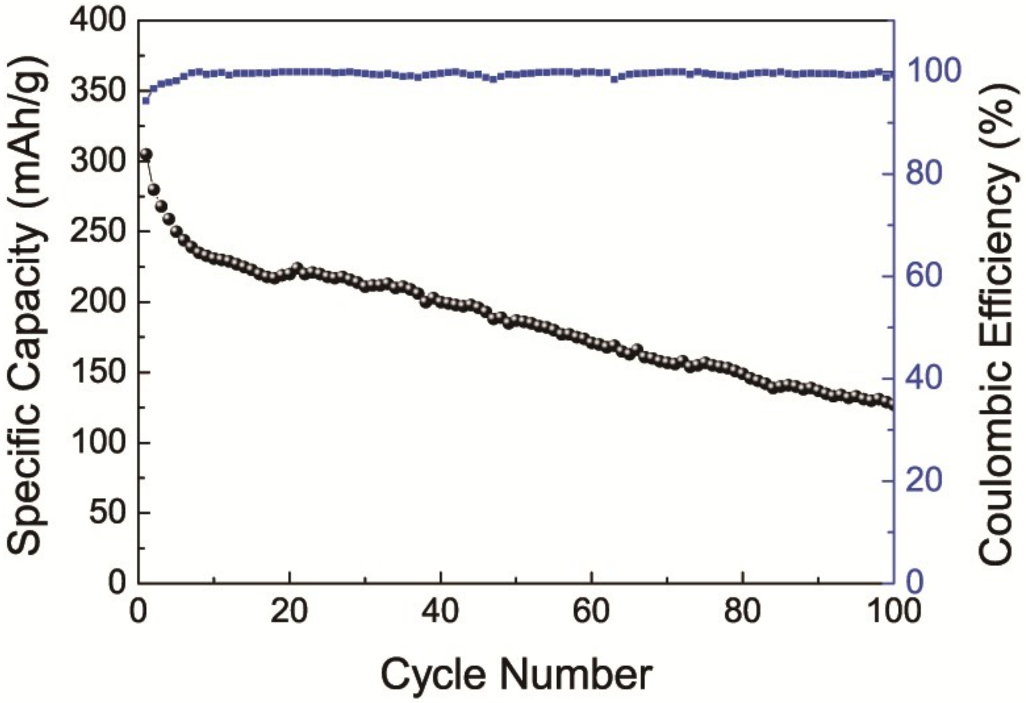

Figure S6. The specific capacities of the wire-type bare fibers with a PPy deposition time of 900s at a current density of 0.4 A/g. (1C=4 A/g)

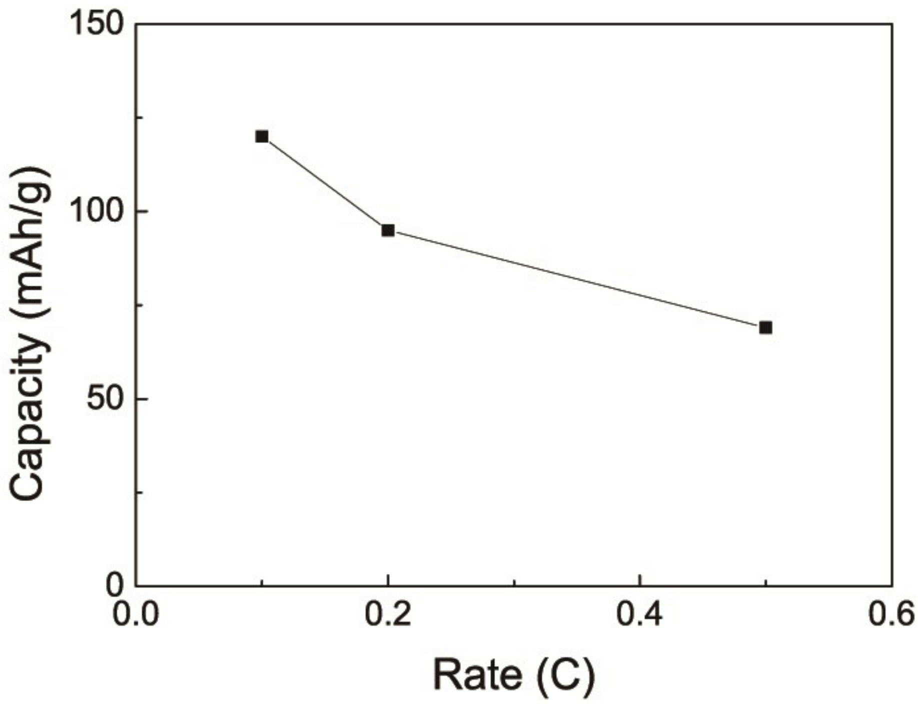

Figure S7. The rate performance of the wire-shaped PPy/CFs (900s) at 100mAh/g, 200mAh/g and 500mAh/g after 100 cycles.

Materials	Specific Capacity (Caculated with Silicon Only)	Specific Capacity (whole)	Rate capability (Caculated with Silicon Only)	Rate capability (whole)	Flexibility performance	Reference
Si@CNT		(1.0 A/g) 1670 mAh/g 1st cycle 1000 mAh/g 50th cycle		(3.0 A/g) 1050 mAh/g	(2.0 A/g bending) 1460 mAh/g 100th cycle	Adv. Mater., 2014, 26, 1217
Si NPs/PPy/CNT	(0.4 A/g) 3000 mAh/g 1st cycle 1100 mAh/g 1000th cycle		(8.3 A/g) 1000 mAh/g			Nano Letter, 2013, 13, 3414
PPy@PHSi		(1.0 A/g) 2400 mAh/g 1st cycle 2100 mAh/g 100th cycle		(8.0 A/g) 661 mAh/g		Adv. Mater., 2014, 26, 6145
Si/PPy fiber		(0.3 A/g) 2854 mAh/g 1st cycle 611 mAh/g 200th cycle		(3.0 A/g) 300 mAh/g		Chem. Commun., 2015, 51. 14590
IP-Si@P-CNTs		(0.1 A/g) 1629 mAh/g 1st cycle 916 mAh/g 200th cycle		(2 A/g) 554 mAh/g		Small, 2015, 11, 2314
Sandwich Si&rGO		(0.4 A/g) 1700 mAh/g 1st cycle 466 mAh/g 200th cycle		(1 A/g) 1000 mAh/g		nanoscale, 2016, 8, 9511
Si/PPy/CF	**(0.4 A/g) 3050 mAh/g 1st cycle 2287 mAh/g 1000th cycle**	**(0.4 A/g) 1802 mAh/g 1st cycle 1304 mAh/g 100th cycle**	**(16 A/g) 1000 mAh/g 100th cycle**	**(16 A/g) 545 mAh/g**	**0.4A/g bending 2197 mAh/g 100th cycle**	**Our Work**

Figure S8. The performance comparison of our Si/PPy/CFs and other devices.

The Capacity Contributions from Polypyrrole and Carbon Fibre

The capacity contributions from the PPy and CFs were calculated as follows. It should be particularly noted that the mass of PPy and CFs was not counted in the total mass of the active material following conventional capacity calculation in most reports, although it contributes to the total capacity.

Total Capacity= (Weight content of PPy and CFs) × (Capacity of PPy and CFs) + (Weight content of Silicon) × (Capacity of silicon)

45.5% × 308 mAh/g +54.5% × (Capacity of silicon mAh/g) = 1802 mAh/g,

Capacity of silicon = 3050 mAh/g