Supporting Information for

High-performance Supercapacitor with Faster Energy Storage and Long Cyclic Life based on CuO@MnO_2 Nano-core-shell Array on Carbon Fiber Surface

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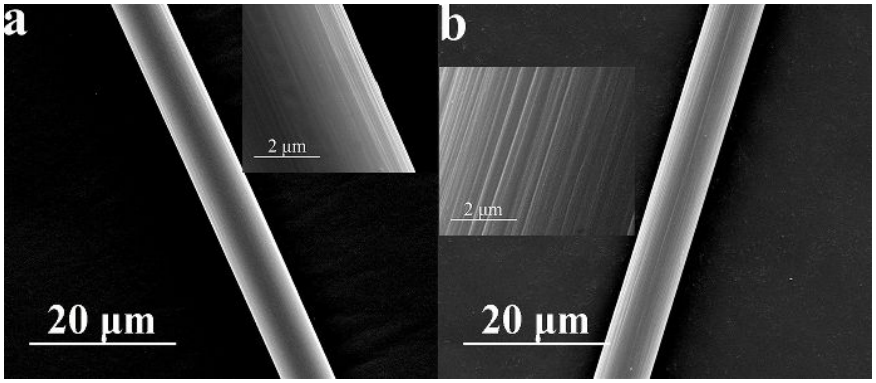

Figure S1. The surface morphology of the original carbon fiber (a) and the desorbed carbon fiber (b).

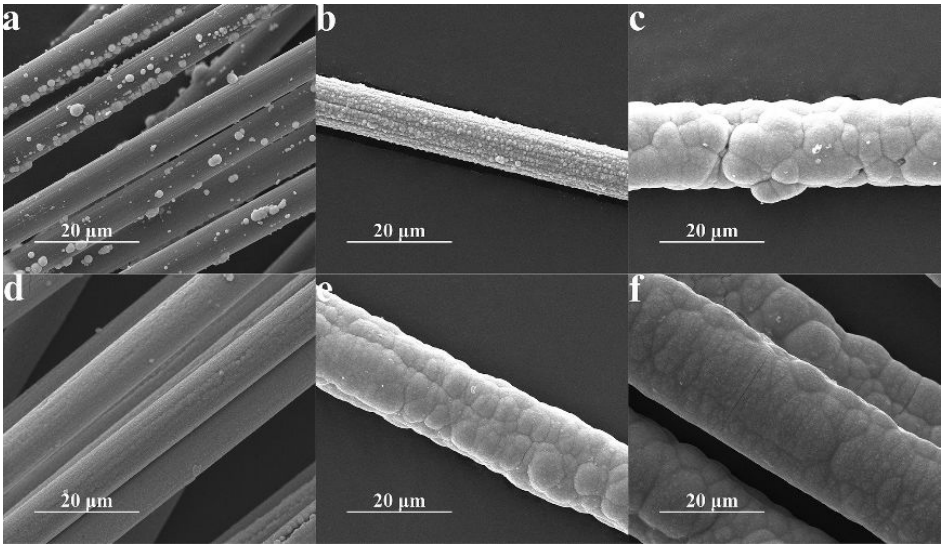

Figure S2. Surface morphology of CF-Cu obtained under different electrochemical deposition conditions: (a) 0.50 mA·cm^{-2}, 30 min; (b) 0.50 mA·cm^{-2}, 90 min; (c) 0.50 mA·cm^{-2}, 150 min; (d) 0.95 mA·cm^{-2}, 90 min; (e) 1.20 mA·cm^{-2}, 90 min; (f) 1.50 mA·cm^{-2}, 90 min.

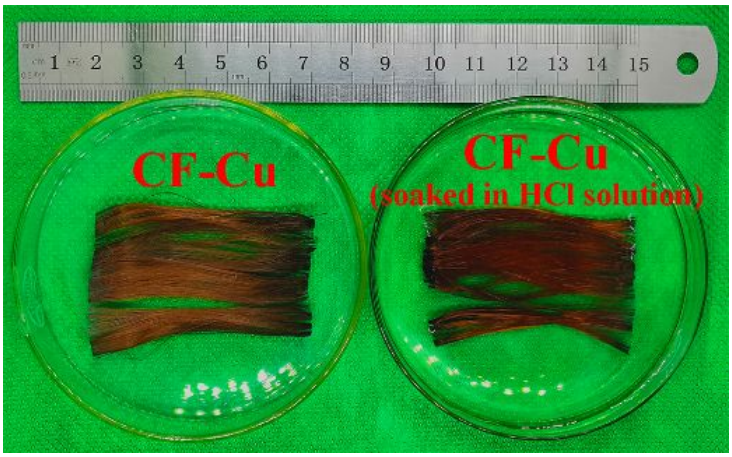

Figure S3. Images of CF-Cu and CF-Cu soaked in HCl (4M) solution.

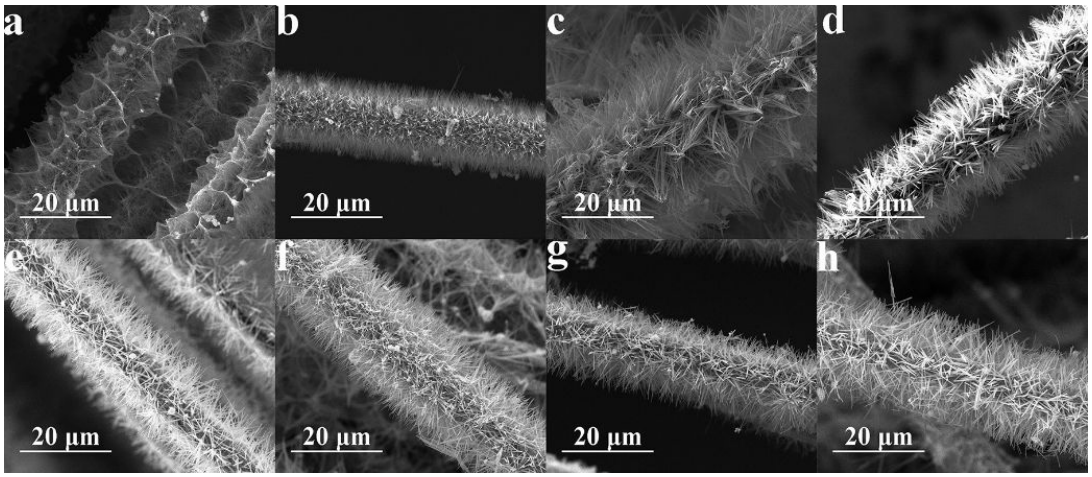

Figure S4. SEM images of CF-$Cu(OH)_2$: (a) 1:10, 20 min; (b) 1:20, 20 min; (c) 1:30, 20 min; (d) 1:40, 20 min; (e) 1:40, 12 min; (f) 1:40, 14 min; (g) 1:40, 16 min; (h) 1:40, 18 min.

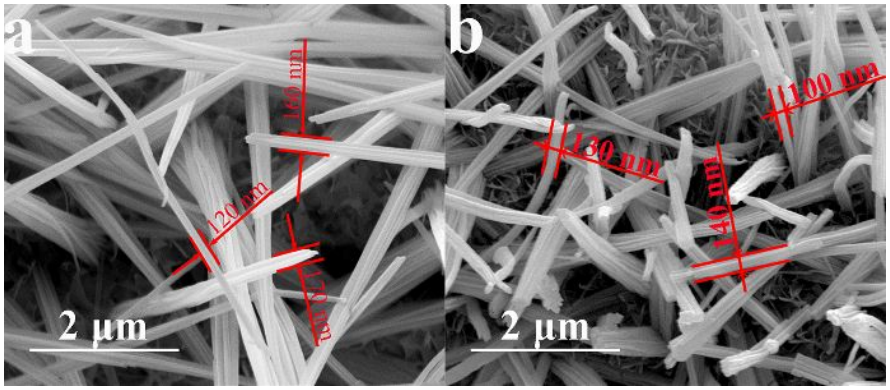

Figure S5. Large-scaled SEM images of CF-$Cu(OH)_2$ (a) and CF-CuO (b).

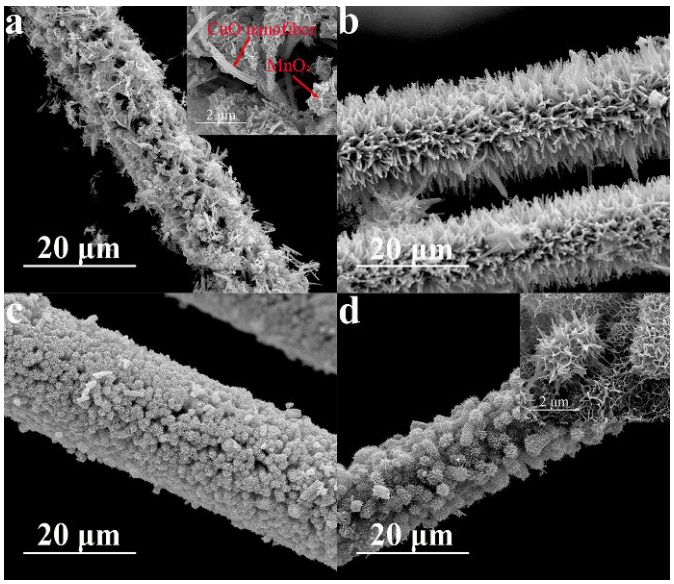

Figure S6. SEM images of CF-CuO@MnO_2: (a) 70%; (b) 85%; (c) 90%; (d) 100%.

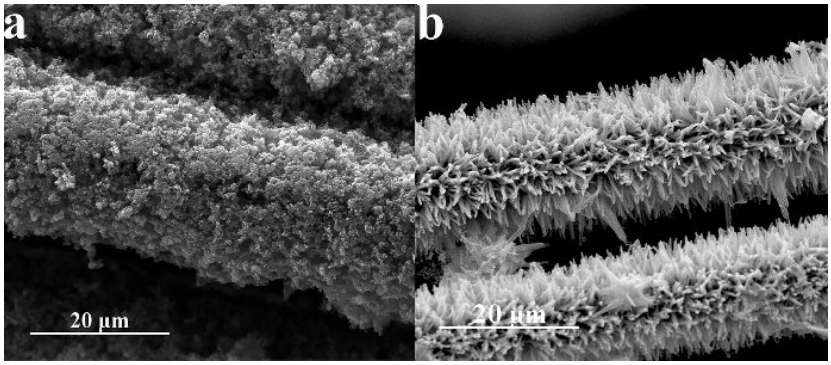

Figure S7. Surface morphologies of CF-Cu (a) and CF-CuO (b) after the reaction under the same conditions.

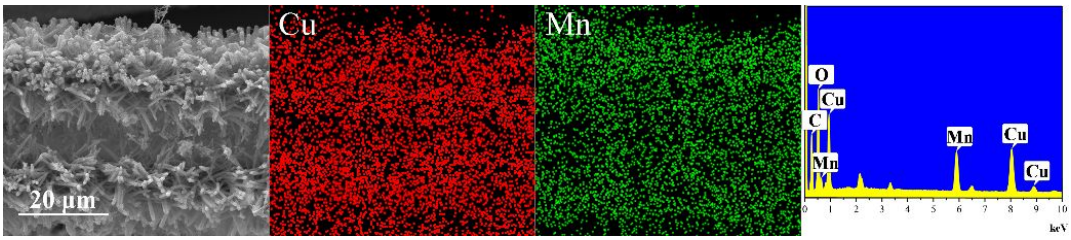

Figure S8. EDS Mapping test results of CF-CuO@MnO_2.

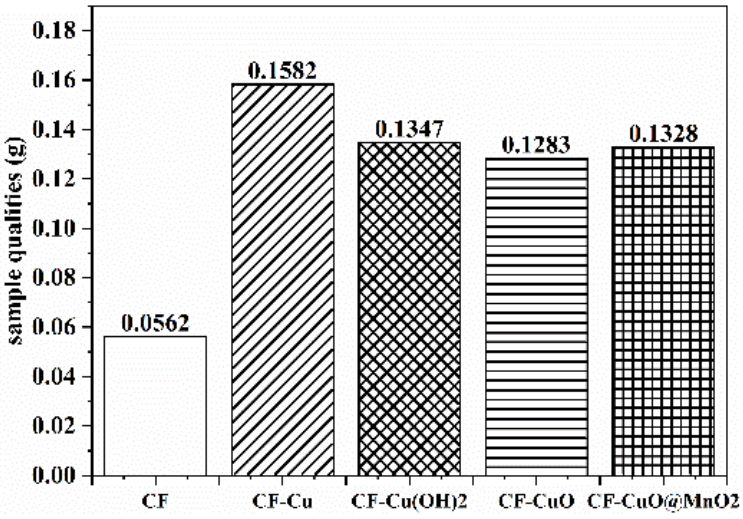

Figure S9. Sample qualities of CF, CF-Cu, CF-Cu$(OH)_2$, CF-CuO, CF-CuO@MnO_2.

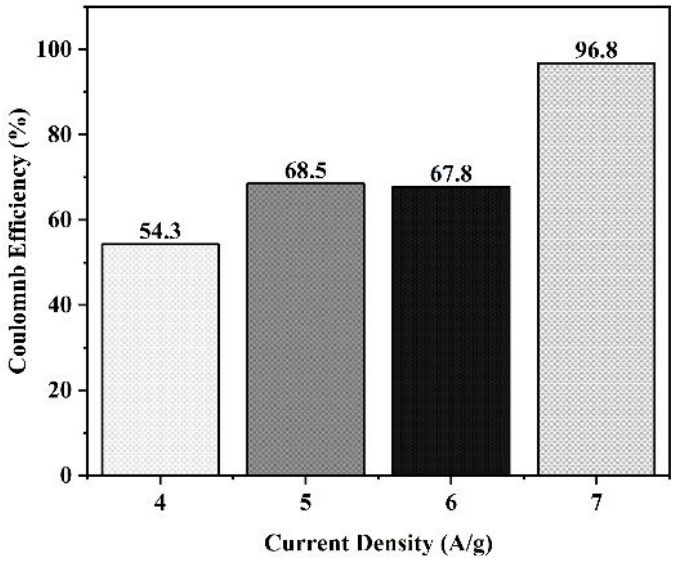

Figure S10. Coulomb efficiency of CF-CuO@MnO_2 at different current densities.

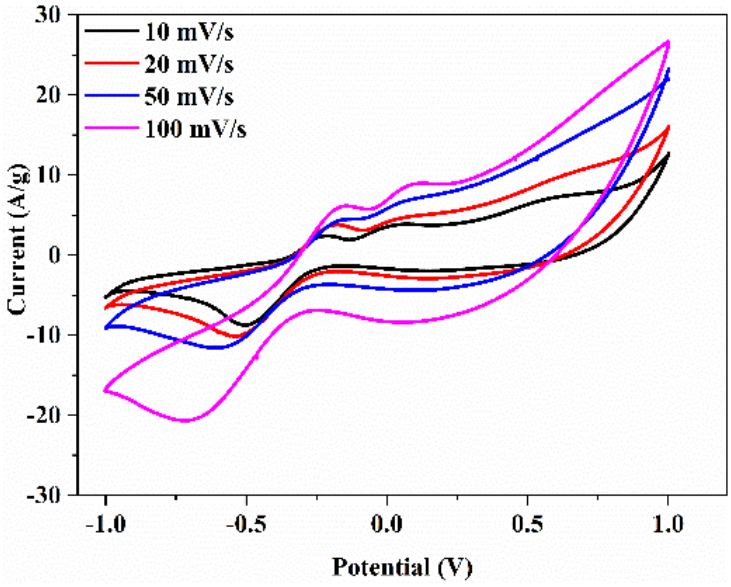

Figure S11. The CV curves of CF-CuO@MnO2 at different scanning speeds

Table S1. Composition of different chemical oxidation solutions

Sample names	$(NH_4)_2S_2O_8$	NaOH	Time
1:10, 20 min	17.40 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	20 min
1:20, 20 min	8.70 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	20 min
1:30, 20 min	5.80 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	20 min
1:40, 20 min	4.35 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	20 min
1:40, 12 min	4.35 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	12 min
1:40, 14 min	4.35 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	14 min
1:40, 16 min	4.35 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	16 min
1:40, 18 min	4.35 $g \cdot L^{-1}$	30.48 $g \cdot L^{-1}$	18 min

Table S2. Different hydrothermal synthesis reaction formulas

Sample names	$KMnO_4$	NaOH
70%	1.11 $g \cdot L^{-1}$	0.028 $g \cdot L^{-1}$
85%	1.34 $g \cdot L^{-1}$	0.034 $g \cdot L^{-1}$
90%	1.42 $g \cdot L^{-1}$	0.036 $g \cdot L^{-1}$
100%	1.58 $g \cdot L^{-1}$	0.040 $g \cdot L^{-1}$

Table S3. Capacitance of various electrode materials at different scanning speeds

Electrode materials	Capacitance ($F \cdot g^{-1}$)	Scanning speeds ($mV \cdot s^{-1}$)
CF-CuO@MnO_2	527.00	10
	317.51	20
	167.41	50
	114.99	100