

Electronic supplementary information

Fe₃O₄/Carbon Nanofibres with Necklace Architecture for Enhanced Electrochemical Energy Storage

Chaopeng Fu, Amoghavarsha Mahadevegowda, Patrick S. Grant*
Department of Materials, University of Oxford, Oxford, United Kingdom, OX1 3PH.
E-mail: chaopeng.fu@materials.ox.ac.uk

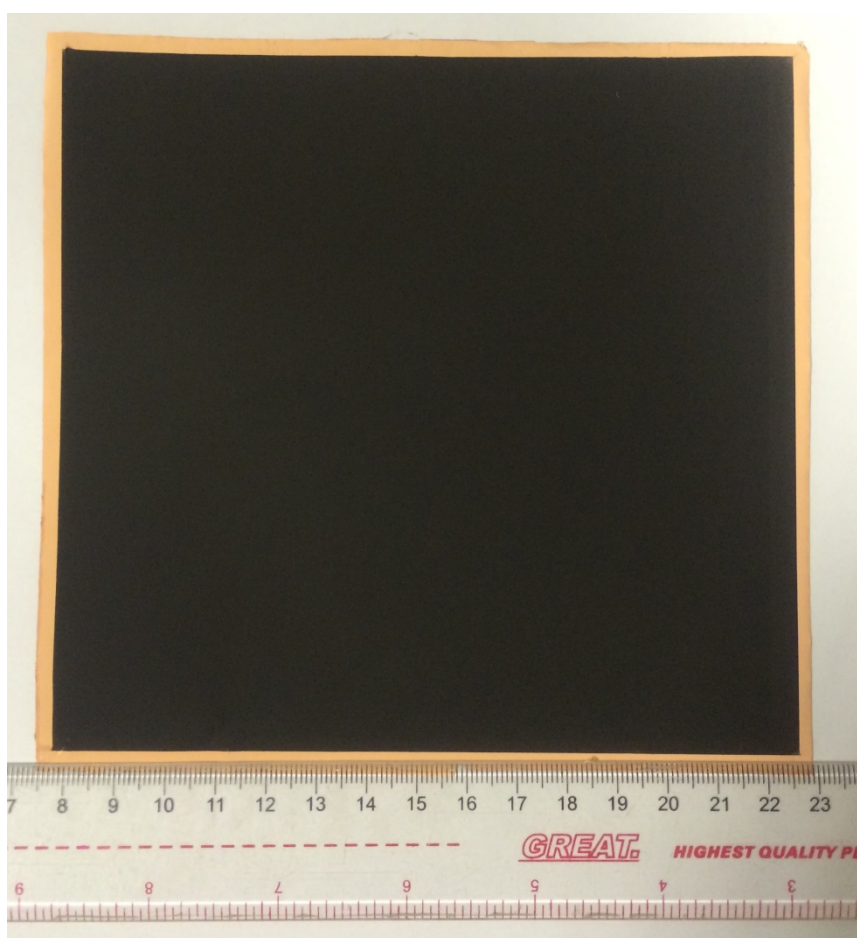


Figure S1: An image of the spray deposited film on Cu substrate.

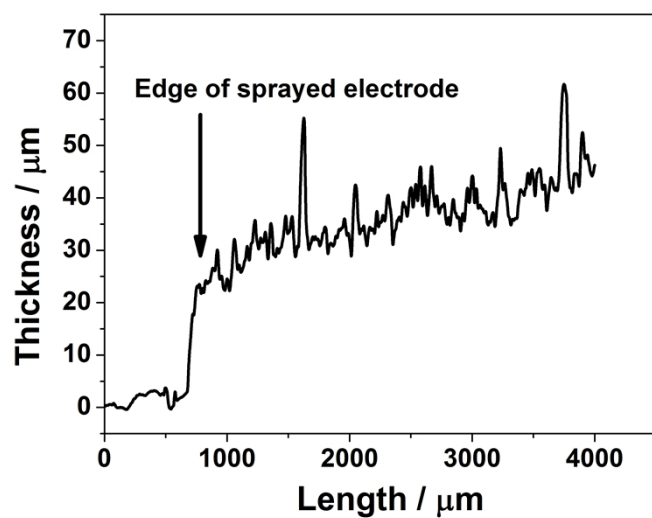


Figure S2: Thickness profile of the sprayed $\text{Fe}_3\text{O}_4/\text{CNF}$ electrode.

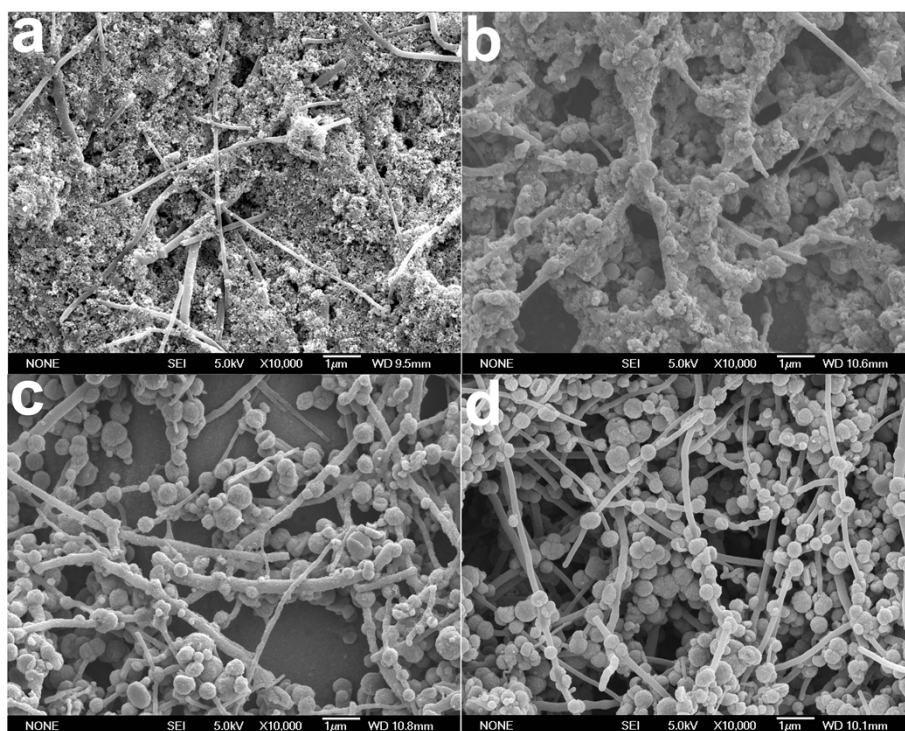


Figure S3: SEM images of the evolution of the necklace structure during hydrothermal processing after: (a) 4 hr, (b) 8 hr, (c) 12 hr, and (d) 16 hr

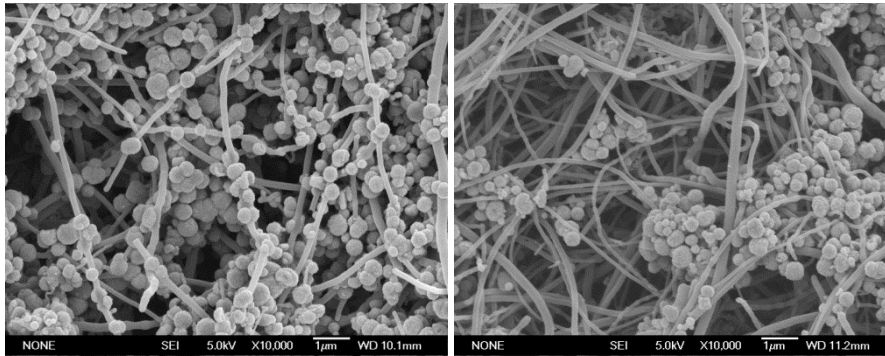


Figure S4: SEM images of the as-prepared $\text{Fe}_3\text{O}_4/\text{CNF}$ necklace (left) and the $\text{Fe}_3\text{O}_4+\text{CNF}$ mixer (right) materials.

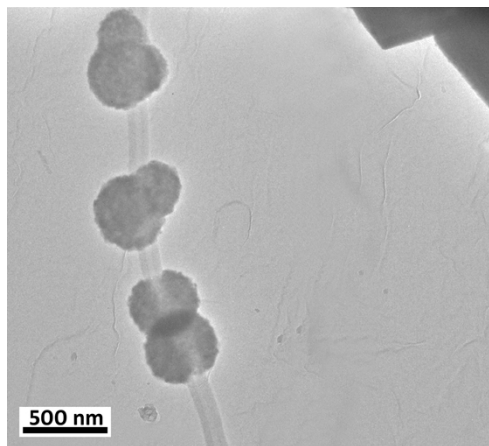


Figure S5: TEM image of the $\text{Fe}_3\text{O}_4/\text{CNF}$ necklace morphology after cycling at a range of charge/discharge rates.

Table S1. Specific capacitances and cycle life of Fe₃O₄ supercapacitor electrodes reported in recent publications

Electrodes	Electrolyte	Specific capacitance F/g	Current density or scan rate	Cycle life retained	Reference
Fe ₃ O ₄ nanowires	Na ₂ SO ₃	70	1 A/g	85% @ 500cycles	[1]
Fe ₃ O ₄ nanorods	Na ₂ SO ₃	40	1 A/g	85% @ 500cycles	[1]
Fe ₃ O ₄ nanosheets	Na ₂ SO ₃	83	0.42 A/g	36% @ 1000 cycles	[2]
Fe ₃ O ₄ nanosheets/CNFs	Na ₂ SO ₃	135	0.42 A/g	93% @ 1000 cycles	[2]
Fe ₃ O ₄ nanoparticles	Na ₂ SO ₃	133	1 A/g	73% @ 2000 cycles	[3]
		90.4	10 A/g		
Fe ₃ O ₄ /carbon nanosheets	Na ₂ SO ₃	163.4	1 A/g	93% @ 5000	[4]
		113	10 A/g		
Carbon coated Fe ₃ O ₄	Na ₂ SO ₃	220	1 A/g	81% @ 500 cycles	[5]
Fe ₃ O ₄ nanoparticles	Na ₂ SO ₃	110	1 A/g	44% @ 2000 cycles	[6]
		55	10 A/g		
Fe ₃ O ₄ /rGO	KOH	187	1 A/g	118% @ 3000 cycles	[7]
Fe ₃ O ₄ @C microspheres	KOH	74.4	1 A/g	95% @ 3000 cycles	[8]
N-Graphene/ Fe ₃ O ₄	H ₂ SO ₄	212	1 A/g	95% @ 1000 cycles	[9]
Fe ₃ O ₄ /graphene	KOH	368	1 A/g	99% @ 1000 cycles	[10]
Fe ₃ O ₄ /FeOOH nanowire	Na ₂ SO ₃	300	2 mV/s	80% @ 1000cycles	[11]
Fe ₃ O ₄ /FeOOH nanowire	KOH, Na ₂ SO ₄	150	2 mV/s	80% @ 1000cycles	[11]
Fe ₃ O ₄ /CNF bead-on-string	KOH	225	1 A/g	85% @ 2000 cycles	This work
		106	10 A/g		

Table S2. Specific capacity and cycle life of Fe₃O₄ anodes reported in recent publications

Electrodes	Stable capacity (mAh/g)	C-rate (A/g)	Cycle life Retained (mAh/g)	First efficiency	Reference																																																																																				
Fe ₃ O ₄ @Carbon	900	0.05	610 @100 cycles	65%	[12]																																																																																				
	500	0.8				Macroporous Fe ₃ O ₄ /C microspheres	1258	1	733@500 cycles	72%	[13]	908	2	Fe ₃ O ₄ /carbon	800	0.1	610@50 cycles	68.3%	[14]	580	1	Carbon coated Fe ₃ O ₄	850	0.1	880@60 cycles	75%	[15]	570	1	Graphene scroll-wrapped of Fe ₃ O ₄	1100	0.1	1000@50cycles	62%	[16]	300	5	Fe ₃ O ₄ @N-rich Carbon Core-Shell Microspheres	700	0.092	670@30 cycles	62%	[17]	600	0.185	Fe ₃ O ₄ / hollow graphene balls	1050	1	690@1000 cycles	71%	[18]	900	2	C-encapsulated Fe ₃ O ₄	1000	1	1000@100 cycles	68%	[19]	868	5	Hollow Fe ₃ O ₄ /C	700	0.1	700@50 cycles	94%	[20]	600	0.5	Fe ₃ O ₄ Confined in Carbon Foam	800	0.5	864@50 cycles	59%	[21]	300	2	Fe ₃ O ₄ /SWNT	1000	0.9	790@60 cycles	75%	[22]	800	4.63	Fe ₃ O ₄ /CNF bead-on-string	900	0.05	836@100 cycles
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