Electronic Supplementary Information

One-Dimensional Nanostructures for Flexible Supercapacitors

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Table S1. Electrochemical performances of different 1D nanomaterials for SCs

Material	Capacity	Energy density	Power density	Cyclic stability	Ref
Carbon					
PAN-derived CNFs	120 F g^{-1} at 1 A g^{-1}				57
$ZnCl_2$-containing PAN nanofibers derived CNFs	140 F g^{-1}				58
Nafion/PAN co-electrospun nanofibers derived CNFs	210 F g^{-1} at 1 A g^{-1}	4 W h kg^{-1}	20 kW kg^{-1}	No obvious decay after 500 cycles	62
PVA/phenolic resin based CNFs	200 F g^{-1} at 1 A g^{-1}			Over 92% after 1000 cycles	63
PPy coated and N-doped CNFs	202 F g^{-1} at 1 A g^{-1}	7.11 W h kg^{-1} (Max.)	89.57 kW kg^{-1} (Max.)	~97% after 3000 cycles	66 41
Bacterial cellulose derived CNFs	77.76 F g^{-1} at 1 A g^{-1}	32.91 W h kg^{-1} (Max.)	284.63 kW kg^{-1} (Max.)	~95.4% after 2000 cycles	42
Bacterial cellulose derived N-doped CNFs	186.6 F g^{-1} at 1 A g^{-1}	6.07 W h kg^{-1} (Max.)	390.53 kW kg^{-1} (Max.)	95.9% after 5000 cycles	43
Bacterial cellulose derived N, P hetero-atom doped CNFs	204.9 F g^{-1} at 1 A g^{-1}	7.76 W h kg^{-1}	186.03 kW kg^{-1} (Max.)	No obvious decay after 4000 cycles	67
Metal oxides and hydroxides					
WO_{3-x}@Au@MnO_2 nanowires	1195 F g^{-1} at 0.75 A g^{-1}	78.1 W h kg^{-1}	36 kW kg^{-1}	No obvious decay after 5000 cycles	68
Mesoporous $NiCo_2O_4$ nanowire on carbon textiles	1283 F g^{-1} at 1 A g^{-1}			57% after 5000 cycles	70
$Ni(OH)_2$ nanowires	270 F g^{-1} at 7.5 A g^{-1}				71
CNT films supported electrodeposited MnO_2 nanowires	300 F g^{-1} at 0.77 A g^{-1}			Over 88% after 3000 cycles	75
MnO_2 nanowires/graphene nanocomposites	31.0 F g^{-1} at 0.5 A g^{-1}	7 W h kg^{-1}	5 kW kg^{-1}	79% after 1000 cycles	76
MnO_2 nanorods on carbon textiles	109 mF cm^{-2}	71 W h kg^{-1}	39 kW kg^{-1}		77
MnO_2/PEDOT coaxial nanowires	210 F g^{-1} at 5 mA cm^{-1}				78
α-Fe_2O_3/MnO_2 core/shell nanowires	801 F g^{-1} at 1 A g^{-1}	17 W h kg^{-1}	30.6 kW kg^{-1}	98.5% after 1500 cycles	79
Zn_2SnO_4/MnO_2 core/shell nanocable	642.4 F g^{-1} at 1 A g^{-1}	36.8 W h kg^{-1}	32 kW kg^{-1}	98.8% after 1000 cycles	80
CuO@MnO_2	49.2 F g^{-1} at 0.25 A	22.1 W h kg^{-1}	85.6 kW kg^{-1}	101.5% after	81

core-shell architectures	g^{-1}	(Max.)	(Max.)	10000 cycles	
Co_3O_4 nanowire@MnO_2	0.56 F cm^{-2} at 11.25 mA cm^{-2}			97.3% after 5000 cycles	56
Co_3O_4@Pt@ MnO_2 nanowire arrays	539 F g^{-1} at 1 A g^{-1}	39.6 W h kg^{-1}	19.6 kW kg^{-1}	105.6% after 5000 cycles	82
ZnO core-shell nanocables	1260.9 F g^{-1}	0.04 mW h cm^{-3}	2.44 mW cm^{-3}	87.5% after 10000 cycles	45
H-TiO_2@MnO_2 core–shell nanowires	449.6 F g^{-1} at 10 mV s^{-1}				74
Worm-like amorphous MnO_2 nanowires grown on textiles	334.7 F g^{-1} at 1 A g^{-1}	6.3 W h kg^{-1}	20.4 kW kg^{-1} (Max.)	83% after 1000 cycles	83
MnO_2 and $M(OH)_2$/MnO_2 nanofiber/nanowires	298 F g^{-1} at 50 mV s^{-1}			85.2% after 1000 cycles	84
MnO_2/Mn/MnO_2 sandwich-structured nanotube arrays	955 F g^{-1} at 1.5 A g^{-1}	45 W h kg^{-1}	23 kW kg^{-1}	95% after 3000 cycles	85
3D CoO@Polypyrrole nanowire array	2223 F g^{-1}	11.8 W h kg^{-1}	5.5 kW kg^{-1}	99.8% after 2000 cycles	88
Mesoporous CoO nanowires	1525 F g^{-1} at 1 A g^{-1}	81 W h kg^{-1}	71 kW kg^{-1}	~91-94% after 5000 cycles	89
Reduced mesoporous Co_3O_4 nanowires	978 F g^{-1} at 2 A g^{-1}			Over 90% after 2000 cycles	90
Co_3O_4/NiO core/shell nanowire arrays	853 F g^{-1} at 2 A g^{-1}			95.1% after 6000 cycles	91
$CoNiO_2$/TiN–TiO_xN_y composites	3181 F g^{-1} at 2 mA cm^{-2}	6.21 W h kg^{-1}	2.21 kW kg^{-1}	About 83% after 3000 cycles	47
Single-crystalline $NiCo_2O_4$ nanoneedle arrays	1118.6 F g^{-1}			89.4% after 2000 cycles	93
Ni−Co hydroxide nanosheets coated on $NiCo_2O_4$ nanowires grown on carbon fiber paper	1.64 F cm^{-2} at 2 mA cm^{-2}	33 W h kg^{-1}	41.25 kW kg^{-1}	81.3% after 2000 cycles	95
Fe_2O_3 nanotubes	180.4 F cm^{-1} at 1 mA cm^{-2}				16
Oxygen-deficient hematite nanorods	277.3 mF cm^{-2} at 10 mVs^{-1}			95.2% after 10000 cycles	72
Fe_2O_3 nanorods on graphene foam/CNT hybrid film	278 mA h g^{-1} at 1 A g^{-1}			96% after 1000 cycles	29
CNT/V_2O_5 nanowire	~500 C g^{-1} at 1 mV s^{-1}				24
WO_{3-x} /MoO_{3-x} core/shell nanowires on carbon fabric	500 mF cm^{-2} ,				73

Metal chalcogenides and nitrides					
Ni_3S_2/CNT	514 F g^{-1} at 4 A g^{-1}			88% after 1500 cycles	98
Co_9S_8 nanorod arrays grown on carbon textiles	2.35 F cm^{-2} at 5 mV s^{-1}				25
Ni-Co sulfide nanowires grown on Ni foam	2415 F g^{-1} at 2.5 mA cm^{-2}			78.5% after 3000 cycles	99
$NiCo_2S_4$ nanotube arrays grown on carbon fiber paper	2.86 F cm^{-2} at 4 mA cm^{-2}			96% after 2000 cycles	100
Three-dimensional $CoSe_2$/carbon cloth	332 mF cm^{-2} at 1 mA cm^{-2}	0.588 mW h cm^{-3}	0.282 W cm^{-3}	95.4% after 5000 cycles	101
Hollow $Co_{0.85}Se$ nanowire array on carbon fiber paper	674 F g^{-1} at 1.48 A g^{-1}	6×10^{-5} W h cm^{-2} (Max.)		89% after 2000 cycles	102
TiN nanowire arrays	0.33 F cm^{-3}	0.05 mW h cm^{-3}	0.3 W cm^{-3} (Max.)	82% after 15000 cycles	48
Porous VN nanowire	298.5 F g^{-1} at 10 mV S^{-1}			95.3% after 10000 cycles	103
Three-dimensional arrays of VN functionalized CNTs	289 F g^{-1} at 20 mV S^{-1}				104
Polymeric materials					
PANI nanowire arrays on GO sheets	555 F g^{-1} at 0.2 A g^{-1}			92% after 2000 cycles	22
Graphene/PANI composite film	385 F g^{-1} at 0.5 A g^{-1}			90% after 5000 cycles	109
PANI nanorods on RGO	970 F g^{-1} at 2.5 A g^{-1}			90% after 1700 cycles	110
PANI nanowires/carbon cloth	1079 F g^{-1}	100.9 W h kg^{-1}	12.1 kW kg^{-1}	86% after 2100 cycles	111
PANI nanowire array/SWCNT composites	410 F g^{-1}	26.6 W h kg^{-1}	7 kW kg^{-1}	90% after 3000 cycles	112
All-solid-state paperlike PANI/CNT film	350 F g^{-1}	7.1 W h kg^{-1}	2.189 kW kg^{-1}	91.9% after 1000 cycles	113
Ultrathin free-standing SWCNT/PANI films	236 F g^{-1}	131 W h kg^{-1}	62.5 kW kg^{-1}	85% after 1000 cycles	114
PANI@C and PPy@C nanowires	189.73 F g^{-1} and 114.08 F g^{-1}			95% and 85% after 10000 cycles.	115
TiO_2@PPy nanowires	64.6 mF cm^{-2} at 10 mV s^{-1}	0.013 mW h cm^{-3}		91.7% after 2000 cycles	44
Other materials					
1D silver nanowires	213 F g^{-1}	4.5 W h kg^{-1}	5.04 kW kg^{-1}	>90% after 10000 cycles	23
Three-dimensional hierarchical $GeSe_2$	300 F g^{-1} at 1 A g^{-1}			99.3% after 2000 cycles	116

Table S2. Comparison of electrochemical performances and flexibilities of the reported 1D nanomaterial-based flexible supercapacitors

Structure	Capacity	Energy density	Power density	Cyclic stability	Flexibility	Ref
Sandwich-type flexible SCs						
SWCNT//SWCNT	120 F g^{-1}	6 W h kg^{-1}	70 kW kg^{-1}		Printable	12
Symmetric MnO_2 nanorods/carbon nanoparticles SC		4.8 W h kg^{-1}	14 kW kg^{-1}	97.3% after 10000 cycles	Bendable	77
H-TiO_2@MnO_2 //H-TiO_2@C	139.6 F g^{-1}	59 W h kg^{-1}	45 kW kg^{-1}	91.2% after 5000 cycles	Bendable and twistable	74
PANI//(WO_{3-x} /MoO_{3-x} core/shell nanowires)	216 mF cm^{-2} ,	0.0019 W h cm^{-3}	0.73 W cm^{-3}	75% after 10000 cycles		73
VO_x nanowires//VN nanowires	1.35F cm^{-3}	0.61 mW h cm^{-3}	0.85 W cm^{-3}	87.5% after 10000 cycles	Bendable	103
Wire-shaped flexible SCs						
ZnO nanowire-fiber	2.4 mF cm^{-2} at 100 mV s^{-1}	10^{-4} W h cm^{-2}	0.1 W cm^{-2}			13
$Ni(OH)_2$ nanowires //mesoporous carbon	35.67 mF cm^{-2}	0.01 mW h cm^{-2}	7.3 mW cm^{-2}	70% after 10000 cycles	Bendable	71
Twisted CNT fibers	13.31 F g^{-1}	92.84 mW h cm^{-3} (Max.)	3.87 W cm^{-3}	97% after 1000 cycles		118
Biscrolled yarn	179 F cm^{-3}	1.4 mW h cm^{-3}	40 W cm^{-3}	99% after 10000 cycles	knittable	119
CNT yarns dotted with Co_3O_4	52.6 mF cm^{-2}	1.10 μWh cm^{-2}	0.01 mW cm^{-2}	96% after 1000 cycles	Bendable	120
PANI coated CNT yarns	38 mF cm^{-2}			91% after 800 cycles	Bendable	30
Coaxial CNT fiber SCs	59 F g^{-1}	1.88 W h kg^{-1}	755.9 W kg^{-1}	No obvious decay after 11000 cycles	Bendable and knittable	121
Stretchable CNT fiber SCs	20 F g^{-1}	0.363 Wh kg^{-1}	421 W kg^{-1}	90% after 1000 cycles	Bendable and stretchable	122
Electrochromic PANI coated CNT fiber SCs	255.5 F g^{-1}	12.75 Wh kg^{-1}	1494 W kg^{-1}	93.8% after 1000 cycles	Bendable and stretchable	123
Stretchable CNT fiber SCs (per-stretched)	30.7 F g^{-1}			99% after 1000 cycles	Stretchable	124
Superelastic CNT fiber SCs	105.8 F g^{-1} at 1 A g^{-1}			90% after 2000 cycles	Bendable and stretchable	125

Chip-type Flexible SCs						
PANI nanorods on RGO patterns	970 F g^{-1} at 2.5 A g^{-1}			90% after 1700 cycles		110
Nano-porous gold/manganese oxide nanowires		55 μW h cm^{-3}	3.4 W cm^{-3}	81% after 10000 cycles		130
3D graphene/CNT carpet	3.93 mF cm^{-2}	2.42 mWh cm^{-3}	115 W cm^{-3} (Max.)	98.4% after 8000 cycles		131
PANI nanowires	588 F cm^{-3}	82 mWh cm^{-3}	1250 W cm^{-3} (Max.)	96% after 1000 cycles	Bendable	132
Carbon/MnO_2 core/shell fibers	2.5 F cm^{-3} at 0.02 A cm^{-3}	2.2×10^{-4} W h cm^{-3}	0.4 W cm^{-3}	84% after 10000 cycles	Bendable	15
Planar-integrated fiber SCs	650 mF g^{-1}			94% after 1000 cycles	Bendable	133