Electronic Supplementary Information (ESI)

Textile Energy Storage in Perspective

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Calculations for Tables 1-2

The data reported in tables 1 and 2 represents results for samples with the highest reported mass loading (which as evidenced by **Figure 8**, results in higher capacitance per area) tested as close to 10 mV/s as possible, or the next closest scan rate. If not reported, capacitance per area (per electrode) was found by multiplying the gravimetric capacitance by the mass per electrode, then dividing by 2 for a symmetric device (**Eq. 1-2**). If gravimetric capacitance and capacitance per area were reported but not mass loading, we can divide the device capacitance per area by the gravimetric capacitance per electrode, and further divide by 2, (**Eq. 3**). Lastly, the energy of the device per area can be calculated and converted to capacity per area (mAh/cm^2) by multiplying the capacitance by ½ times the voltage, and times 3.6 and divide by the given area (**Eq. 4**).

$$\frac{F}{g}\cdot\frac{g}{cm^2}=\frac{F}{cm^2}=C_{Electrode}=\text{electrode capacitance} \quad (1)$$

$$\frac{1}{C_{electrode}}+\frac{1}{C_{electrode}}=\frac{1}{C_{device}}\ \text{(symmetric cell only)},\qquad \frac{C_{electrode}}{2}=C_{device}=\text{device capacitance} \quad (2)$$

$$\frac{\left[\frac{C_{device}}{cm^2}\div\frac{C_{electrode}}{g}\right]}{2}=\frac{g}{cm^2}=\text{mass of one electrode per cm}^2 \quad (3)$$

$$E=\frac{1}{2}C_{device}V^2=\frac{1As}{2V}V^2,\ \frac{mAh}{cm^2}=\frac{1As}{2V}V\cdot\frac{3600\frac{s}{h}}{1000\frac{mA}{A}}\div cm^2 \quad =\text{capacity per cm}^2 \quad (4)$$

Equations to determine capacitance from experiments:

$$Q = CV \quad (5)$$

$$C_{CV}=\left(\frac{dQ}{dt}\right)/\left(\frac{dV}{dt}\right) \quad (6)$$

Where C is capacitance (Farads), V is the voltage, and Q is the stored charge. C_{CV} is the capacitance from a cyclic voltammogram, dQ/dt is the charge accumulated in time, and dV/dt is the sweep rate across the voltage window. Q can be determined by integrating the area under the CV curve.

$$C_{GC}=\frac{i}{\frac{dV}{dt}} \quad (7)$$

For galvanostatic cyling, *i* is the applied current (e.g., 10 mA) and dV/dt is the change in voltage over time as the capacitor charges, as well as the slope of the discharge curve.

$$ESR_{GC}=\frac{\Delta V}{i} \quad (8)$$

Where ΔV is the voltage drop as the capacitor switches from charging to discharging, and *i* is again the applied current.

The ESR from an EIS plot is typically taken from the real impedance (of a nyquist plot) where the curve intersects the X-axis, or the real impedance at 1 kHz.

Table 1. Full Fabric Supercapacitors and batteries from literature and their respective materials, active mass loadings per electrode and device capacitance or capacity per area. CF=carbon fiber, CFF=carbon fiber fabric, NW = nano wires, AC = activated carbon

Device Materials	**Fabric**	**Electrolyte**	**Mass of active material per electrode area (mg/cm^2)**	**Device Capacitance per area (mF/cm^2)**	**Device Capacity per area (mAh/cm^2)**	**Refs.**
AC	Cotton and polyester	1M Na_2SO_4	4.00	240.00	0.43	1
AC (from cellulose)	Knitted cotton	1M Na_2SO_4	5.00	127.00	0.235	2
AC	Knitted CFF	PVA-H_3PO_4-SiWA	12.00	510.00	0.73	3
SWCNTs	Knitted cotton	1M $LiPF_6$	8.00	480.00	2.59	4
SWCNTs	Nonwoven cotton	Li_2SO_4/Na_2SO_4	0.47	16.40	0.0025	5
Graphene paint	Woven cotton	1M KOH	1.08	43.50	0.08	6
Graphene	Ni-coated nylon mesh	1M Na_2SO_4	0.25	44.70	0.055	7
SWCNTs + MnO_2	Knitted cotton	2M Li_2SO_4	0.24 CNTs, 1.6 MnO_2	276.00	0.4	4
Graphene + MnO_2	Nonwoven polyester	0.5 M Na_2SO_4	1.25 MnO_2	275.00	0.4	8
Graphene/CNT/Fe_3O_4	--	1M Na_2SO_4	0.00	0.98	0.015	9
Zn2SnO4/MnO_2	CFF	1M Na_2SO_4	0.90	288.00	0.415	10
MnO_2	AC	1M Na_2SO_4	+2.4 MnO_2	292.00	0.5	2
WO_3–x@Au@MnO_2 core–shell nanowires	CFF	0.1 M Na_2SO_4	0.31 MnO_2	57.00	0.08	11
MnO_2/carbon	ZnO NW	PVA-LiCl	0.11 MnO_2	26.00	0.035	12
(MnO_2) - zinc (Zn)	Ag-coated knit	PVA-6 M KOH and 0.4 M ZnO	16-18	1.08	1.94	13
$LiFePO_4$ cathode and $Li_4Ti_5O_{10}$ anode	Nonwoven polyester	1M $LiPF_6$	168.00	2030.00	27.00	14
$LiFePO_4$ cathode and $Li_4Ti_5O_{10}$ anode	n/a	PVA-$LiPF_6$	n/a	n/a	n/a	15

Table 2. Fiber and Yarn supercapacitors and batteries from literature, including their active materials, active mass loading per electrode and device capacitance or capacity per length. CF=carbon fiber, CFF=carbon fiber fabric, NW=nano wires, StS=stainless steel, PANi = polyaniline

Device Materials	**Base yarn**	**Electrolyte**	**(mg/cm)**	**Device Capacitance per length (mF/cm)**	**Device Capacity per length (mAh/cm)**	**Refs.**
Copper wire, "metal" sheets	Cu wire	n/a	n/a	0.000001	--	16
Graphitic pen ink	"Plastic fiber"	Na_2SO_4 or PVA-H_3PO_4	n/a	0.5	0.001	17
Spun graphene nanoribbon	--	PVA-H_3PO_4	n/a	0.5	0.001	18
Electrolyzed graphene	Graphene	PVA-H_3PO_4	n/a	0.019	0.0005	19
Biscrolled CNTs – PEDOT:PSS	Stainless steel	PVA-H_3PO_4	0.0057	0.5	0.001	20
Airbrushed CNTs	CF	PVA-H_3PO_4	0.4	6.3	0.012	21
KnO NW with MnO2	Kevlar	PVA-H_3PO_4	n/a	0.021	0.0005	22
MnO2	CF	PVA-H_3PO_4	n/a	0.0025	--	23
PANi NW	CNT	PVA-H_3PO_4	n/a	1.79	0.003	24
PANi-StS	Pt-StS	0.6 M 1-butyl-3-methylimidazolium	n/a	20	0.036	25
Ni-Sn	Cu wire	LiCoO2	n/a	51.3	0.37	26

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