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Supporting Information

From Energy Storage to Pathogen Eradication: Unveiling the Antibacterial and Antiviral Capacities of Flexible Solid-State Carbon Cloth Supercapacitors

Sara Beikzadeh [a,b], Alireza Akbarinejad [a], John Taylor [c], Janesha Perera[d], Jacqueline Ross[e], Simon Swift [d], Paul A. Kilmartin [a], and Jadranka Travas-Sejdic [a,b*]

a. Centre for Innovative Materials for Health, School of Chemical Sciences, The University of Auckland, 23 Symonds Street, Auckland, 1023, New Zealand
b. MacDiarmid Institute for Advanced Materials and Nanotechnology, Kelburn Parade, Wellington, 6140, New Zealand
c. School of Biological Sciences, The University of Auckland, Auckland, New Zealand
d. Department of Molecular Medicine and Pathology, Faculty of Medical and Health Sciences, The University of Auckland, Private Bag 92019, Auckland 1042, New Zealand
e. Department of Anatomy and Medical Imaging, The University of Auckland, Private Bag, Auckland 92019, New Zealand

Optimization of CCSC

For the capacitance optimization experiments of CCSC, different weight ratios of NaCl and glycerol were used, as denoted in Table S.1.

Table S.1. Weight ratios of the solid polymer electrolyte components and corresponding CCSC coding.

PVA : NaCl : glycerol (weight ratio)	CCSC code	Areal capacitance, mF/cm^2 (scan rate 100 mV/s)	PVA : NaCl : glycerol (weight ratio)	CCSC code	Areal capacitance, mF/cm^2 (scan rate 100 mV/s)

1: 0.2 : 1	P1-N0.2-G1	0.53 ± 0.03	1: 0.8 : 0.2	P1-N0.8-G0.2	0.73 ± 0.06
1: 0.4 : 1	P1-N0.4-G1	2.57 ± 0.12	1: 0.8 : 0.4	P1-N0.8-G0.4	1.43 ± 0.13
1: 0.6 : 1	P1-N0.6-G1	2.69 ± 0.22	1: 0.8 : 0.6	P1-N0.8-G0.6	2.56 ± 0.26
1: 0.8: 1	P1-N0.8-G1	4.15 ± 0.25	1: 0.8 : 0.8	P1-N0.8-G0.8	3.79 ± 0.34
1: 1.0: 1	P1-N1-G1	3.27 ± 0.30	1: 0.8 : 1.2	P1-N0.8-G1	3.37 ± 0.11

Data are means ± SD.

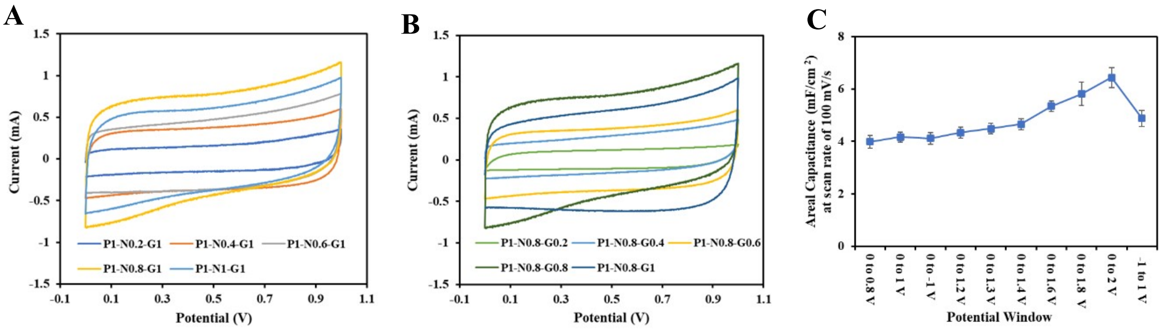

Figure S. 1A. CV curves of CCSCs with the different weight ratios of NaCl at a scan rate of 100 mV/s; **B.** CV curves of CCSCs with the different weight ratios of glycerol. **C.** Average areal capacitance of CCSCs at a scan rate of 100 mV/s over different potential ranges (n = 3).

The CV curves of CCSCs, at the scan rate of 100 mV/s, with different weight ratios of either NaCl or glycerol, are presented in Figure S1 A and B, respectively. The wider the CV loops, the higher the capacitance. The calculated areal capacitances, based on the integrated area of the CV curves of CCSC with different ratios of glycerol and NaCl Figure S1 A and B are presented in Table S1. P1-N0.8-G1 showed the highest capacitance (4.15 ± 0.3 mF/cm^2) among the samples with different NaCl concentrations. The capacitance of CCSCs increased by 4 times with the increase of NaCl weight ratio from 0.2 to 0.8, and then it decreased once the weight ratio of NaCl increased from 0.8 to 1. It was shown that NaCl could salt out the PVA [1]. The increase in NaCl concentration could lead to excessive PVA entanglements of polymer chains in microcrystalline zones or a change in water structure, affecting the electrolyte's electrochemical performance [1].

Figure S1 B shows the optimization of the CV performance of the CCSC device with different glycerol content in the electrolyte. Glycerol acts as a plasticizer and a physical crosslinker by forming stable multiple hydrogen bonding domains in the structure of the polymer electrolyte, which enhances the flexibility of PVA [1] and the electrochemical performance of CCSCs. The maximum areal capacitance of 4.15 ± 0.3 mF/cm^2 was recorded for the sample P1-N0.8-G1 (Table S1). This could be attributed to the good interaction between the electrode and the hydrogel electrolyte for high EDL charge storage, which influences the electrode-electrolyte interface state and determines the performance of a supercapacitor [2-4]. The capacitance of the CCSCs increased 5 times with the increase of glycerol weight ratio from 0.2 to 1 (Table S.1). The PVA: NaCl: Glycerol weight ratio of 1:0.8:1 was used as the optimized solid polymer electrolyte sample for the following experiments.

References

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