

Supporting information

3D-printed fully biocompatible supercapacitor

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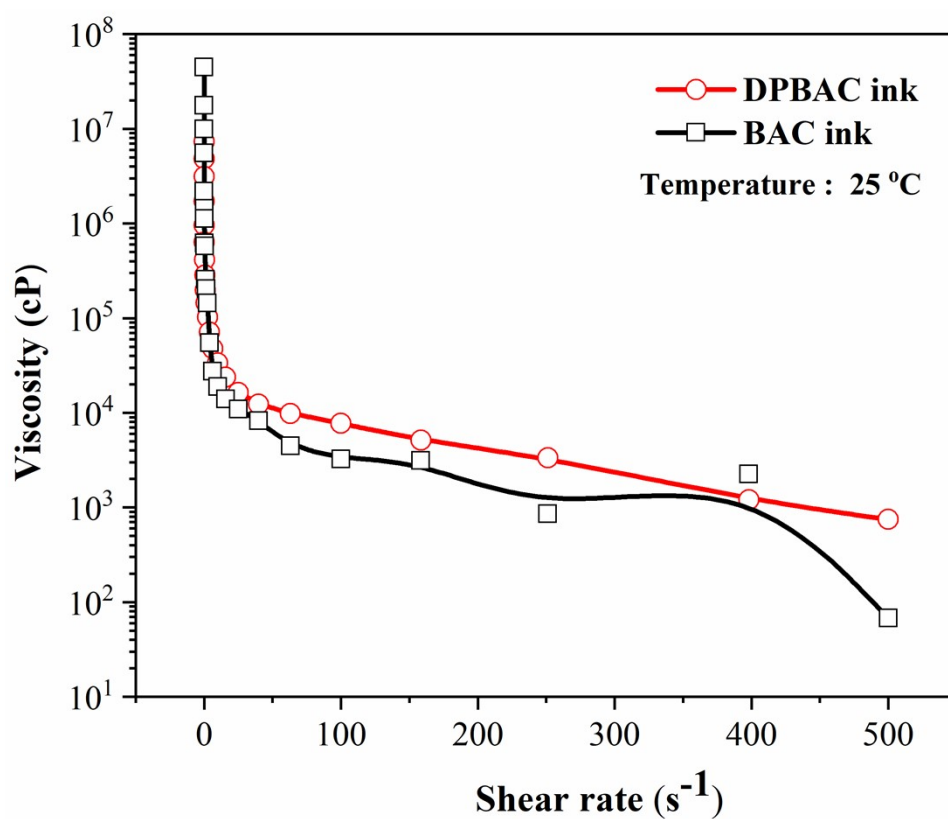
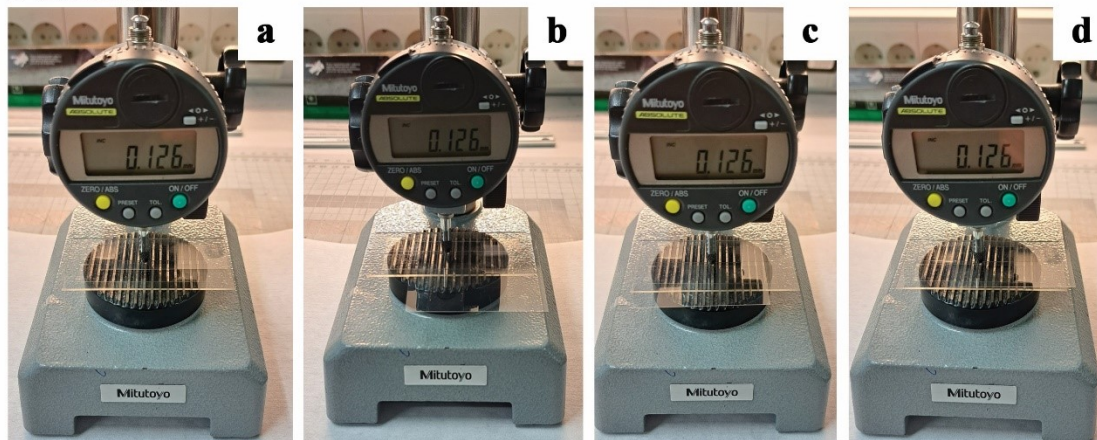


Fig. S1. Viscosity of a BAC and DPBAC inks as a function of shear rate

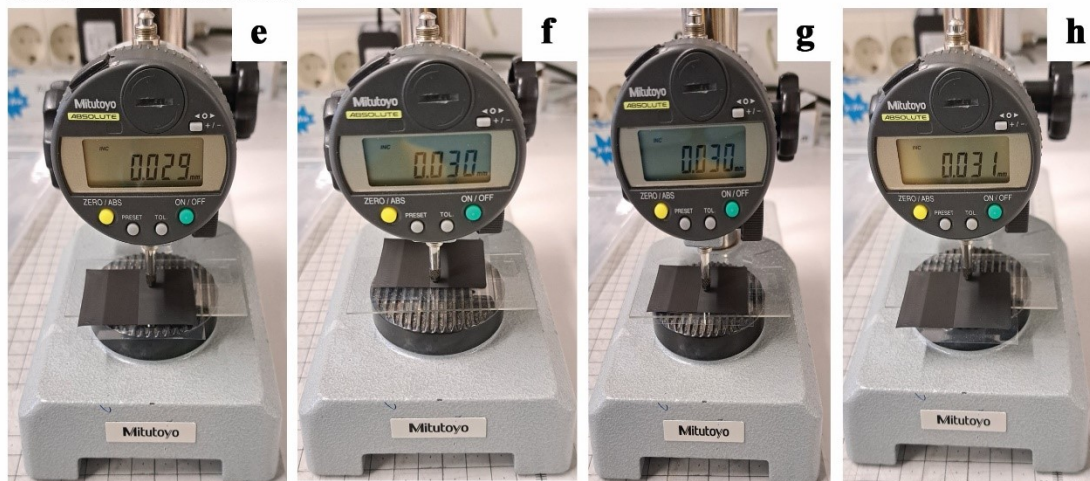


Fig. S2 Images of (a) graphite and activated carbon inks, (b) ink with a fluid body, (c) Piezo jet module fitted with ink, (d) printed graphite ink (current collector) and printed DPBAC (electrode) on polylactic acid (substrate)

Substrate



Current Collector



Electrode

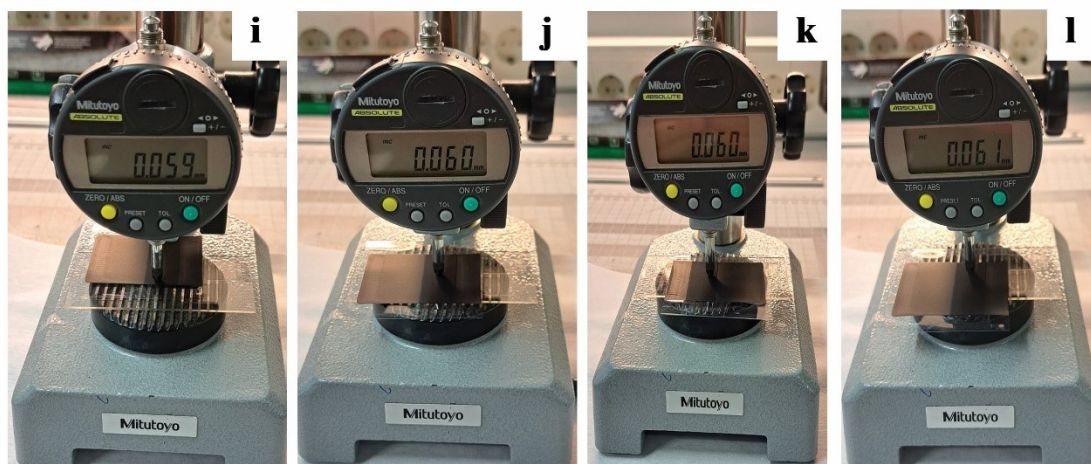


Fig. S3. Digital images of thickness measurements for the substrate (a-d), current collector (e-h), and electrode (i-l) taken at various points.

Zeta Potential Report

v2.3

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Sample Details

Sample Name: BAC
SOP Name: mansettings.nano
General Notes:

File Name: Vijay.dts
Record Number: 326
Date and Time: Wednesday, 25 January 2023 17:....
Dispersant Name: Water
Dispersant RI: 1.330
Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

System

Temperature (°C): 25.0
Count Rate (kcps): 146.6
Cell Description: Clear disposable zeta cell
Zeta Runs: 12
Measurement Position (mm): 2.00
Attenuator: 8

Results

	Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -24.8	Peak 1: -20.8	61.1	5.90
Zeta Deviation (mV): 8.00	Peak 2: -32.0	38.9	3.93
Conductivity (mS/cm): 0.00628	Peak 3: 0.00	0.0	0.00
Result quality : Good			

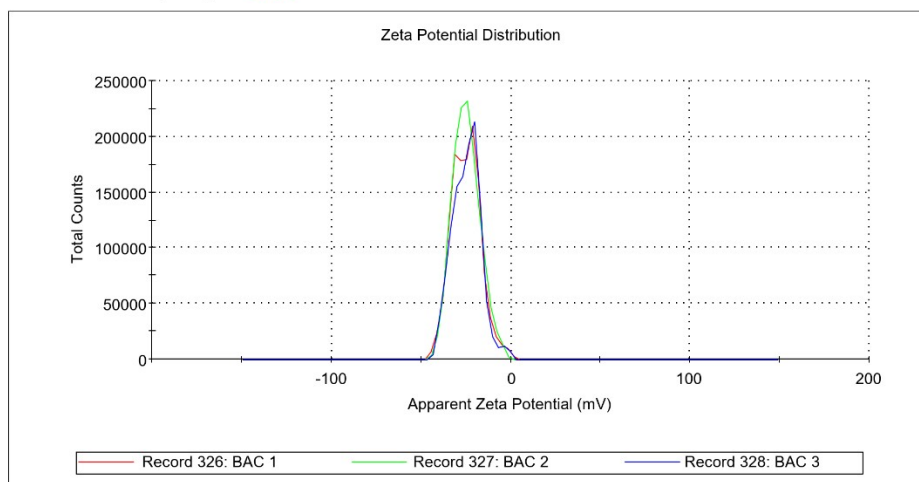


Fig. S4. Zeta potential of analysis of BAC

Zeta Potential Report

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Sample Details

Sample Name: DPBAC

SOP Name: mansettings.nano

General Notes:

File Name: Vijay.dts Dispersant Name: Water
Record Number: 395 Dispersant RI: 1.330
Date and Time: Saturday, 20 May 2023 14.33.22 Viscosity (cP): 0.8872
Dispersant Dielectric Constant: 78.5

System

Temperature (°C): 25.0 Zeta Runs: 12
Count Rate (kcps): 145.9 Measurement Position (mm): 2.00
Cell Description: Clear disposable zeta cell Attenuator: 7

Results

	Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -13.6	Peak 1: -13.6	100.0	10.5
Zeta Deviation (mV): 10.5	Peak 2: 0.00	0.0	0.00
Conductivity (mS/cm): 0.0149	Peak 3: 0.00	0.0	0.00
Result quality : Good			

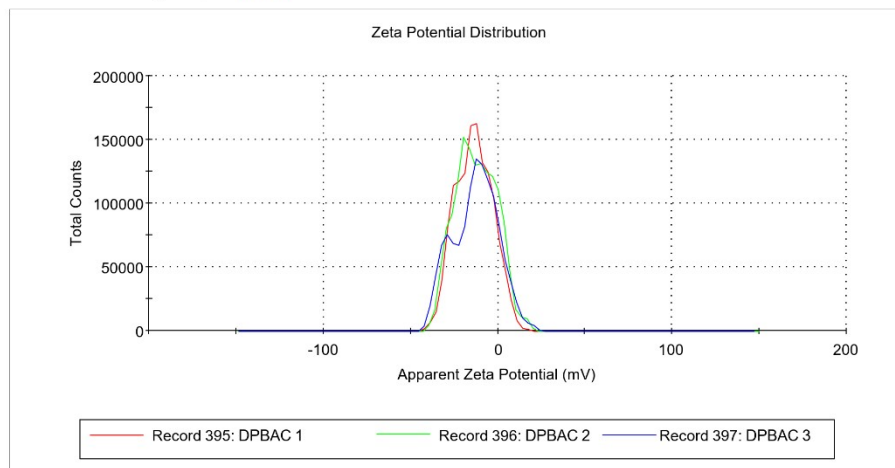


Fig. S5. Zeta potential of analysis of DPBAC

Zeta Potential Report

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Sample Details

Sample Name: Dopamine hydrochloride

SOP Name: mansettings.nano

General Notes:

File Name: Vijay.dts	Dispersant Name: Water
Record Number: 403	Dispersant RI: 1.330
Date and Time: Saturday, 20 May 2023 15.02.03	Viscosity (cP): 0.8872
	Dispersant Dielectric Constant: 78.5

System

Temperature (°C): 25.0	Zeta Runs: 15
Count Rate (kcps): 480.9	Measurement Position (mm): 2.00
Cell Description: Clear disposable zeta cell	Attenuator: 11

Results

	Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): 5.29	Peak 1: 5.29	100.0	9.33
Zeta Deviation (mV): 9.33	Peak 2: 0.00	0.0	0.00
Conductivity (mS/cm): 0.585	Peak 3: 0.00	0.0	0.00
Result quality: Good			

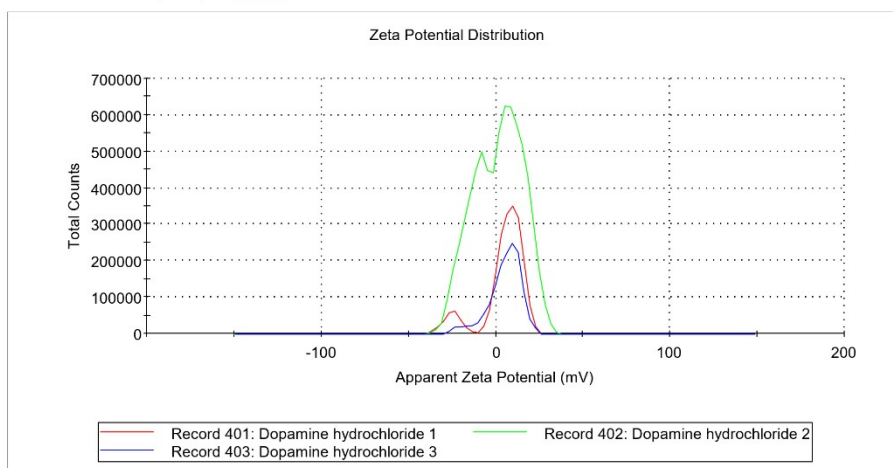


Fig. S6. Zeta potential of analysis of dopamine hydrochloride

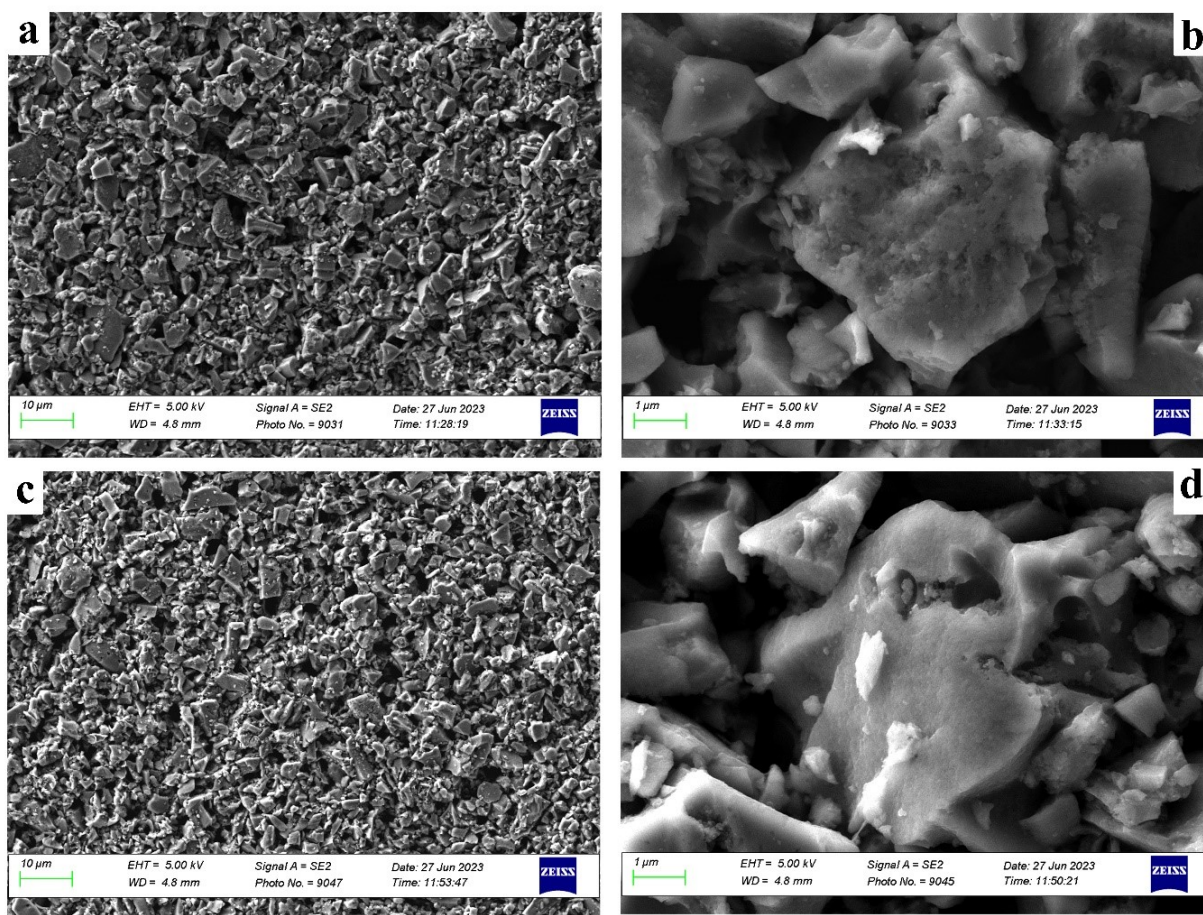


Fig. S7. FE-SEM images of (a) BAC, (b) zoomed-in view of sample a, (c) DPBAC and (d) zoomed-in view of sample c.

Comparison of electrochemical performance of aqueous electrolyte versus Reline

To investigate the impact of Reline electrolyte, the electrochemical performance of Reline was compared with an aqueous electrolyte (NaCl:Water:1:5 wt.%), known for its safety compared to conventional electrolytes like H_2SO_4 or KOH. It is noteworthy that Reline can achieve a higher voltage window of up to 2.0 V, whereas the aqueous electrolyte is limited to 1.2 V due to water decomposition. To facilitate a meaningful comparison, three SCs connected in series for the aqueous electrolyte (NaCl:Water: 1:5 wt.%) and two SCs in series for the Reline-based SCs using conductive copper tape. The CV and GCD curves for the fabricated SCs were recorded, and the results are displayed in Fig. 8a and 8b. The maximum specific capacitance achieved through GCD measurements was 11.8 F g^{-1} at a current density of 0.02 A g^{-1} for Reline (2 SCs in series), which significantly surpassed the 5.9 F g^{-1} capacitance observed for the SCs fabricated with the aqueous electrolyte (3 SCs in series).

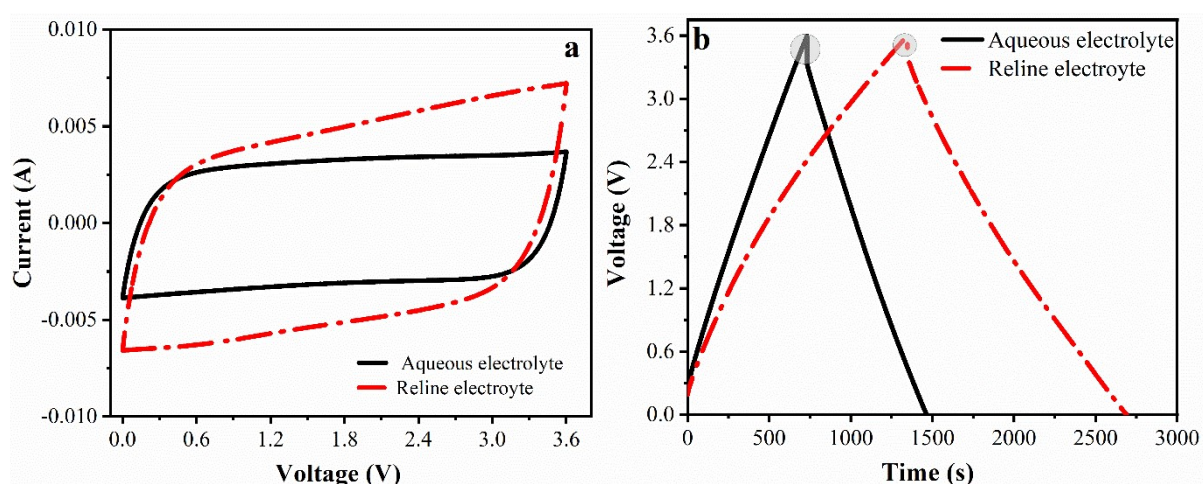


Fig. S8 Comparison of (a) CV recorded at a scan rate of 5 mVs^{-1} and (b) GCD curves recorded at a constant current of 0.06 A g^{-1} for supercapacitors fabricated using two different electrolytes: aqueous electrolyte and Reline.