Carbon Quantum Dots–Anchored Polyaniline on Electrospun Carbon Nanofibers as Freestanding Electrodes for Symmetric Solid-state Supercapacitor

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Characterization

The instruments and ancillary information used for the basic characterization of the microstructure of electrode materials are as follows: Scanning Electron Microscopy (SEM, Hitachi SU70), Transmission Electron Microscopy (TEM, Philips TECNAI-20), X-ray Diffraction (XRD, Rigaku D/max2600), Fourier Transform Infrared Spectroscopy (FTIR, Alpha-Centauri), and X-ray Photoelectron Spectroscopy (XPS, Shimadzu AXIS SUPRA+). A 5 mV disturbance voltage was used to conduct electrochemical impedance spectroscopy (EIS) employing VMP3 electrochemical analyzer.

Figure Captions:

Fig. S1 The diameter histogram of (a) CNFs, (b) CNFs/PANI, and (c) CNFs/PANI/CQDs NFs.

Fig. S2 (a) CV and (b) GCD curves of PANI, and (c) CV and (d) GCD curves of PANI/CQDs hybrid electrode at various scan rates and current densities.

Fig. S3 The inverse of the stored charge versus the square root of the scan rate.

Fig. S4 Equivalent circuit of CNFs/PANI/CQDs electrode.

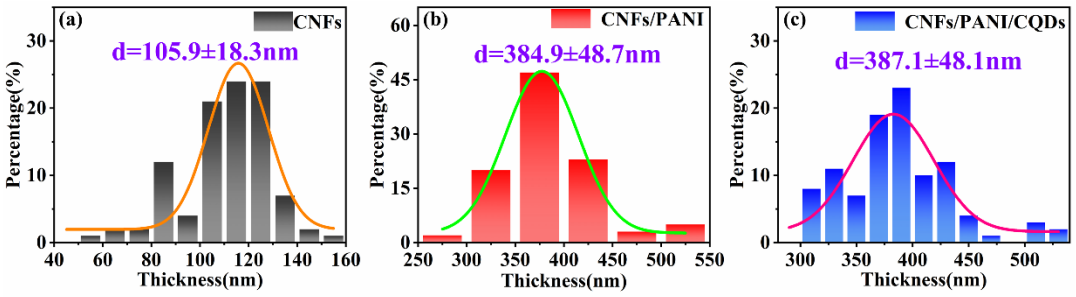
Fig. S5 SEM image of CNFs/PANI/CQDs free-standing electrode after electrochemical tests.

Fig. S6 (a-d) CV curves of CNFs/PANI/CQDs electrode and the corresponding capacitive contributions at scan rates of 10, 20, 30 and 50 mV s^{-1}.

Fig. S7 (a) CV curves, (b) GCD data, and (c) image of the symmetric SSC after mechanical bending, (g) along with its application in red LED lighting.

Fig. S8 The Nyquist curves of the symmetric SSC.

Table S1 Capacitance values of the CNFs/PANI/CQDs electrode and cycling ability of symmetric SSC contrast of relevant reports.



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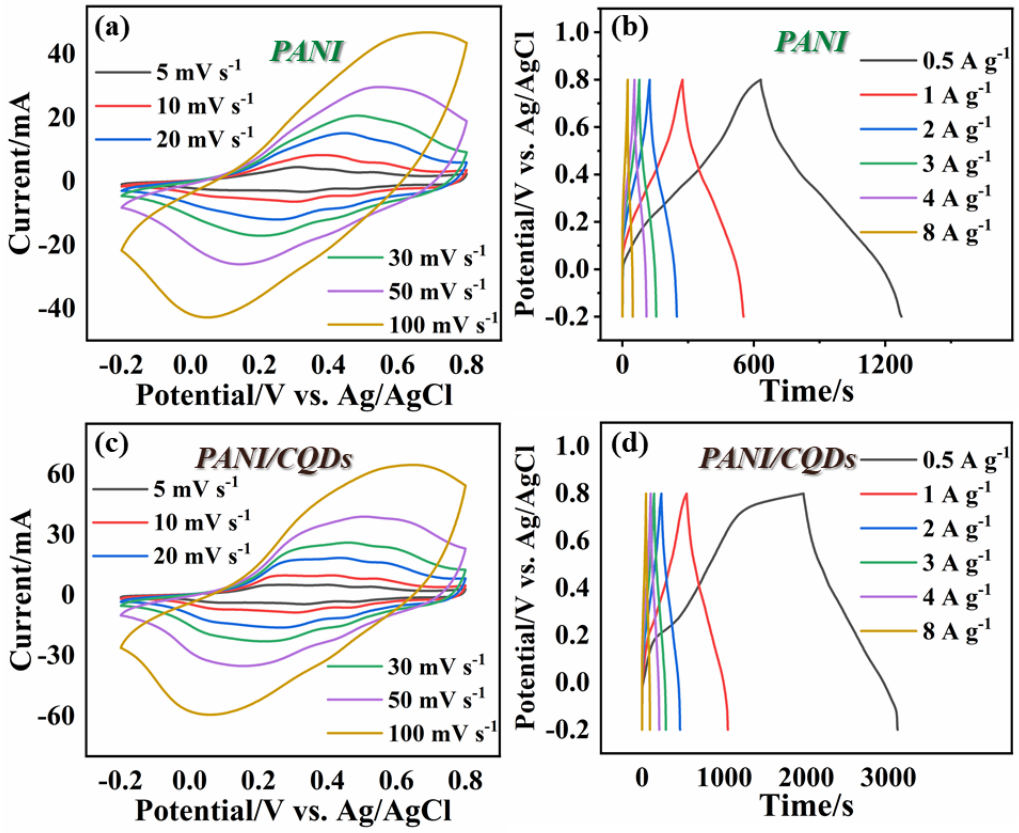

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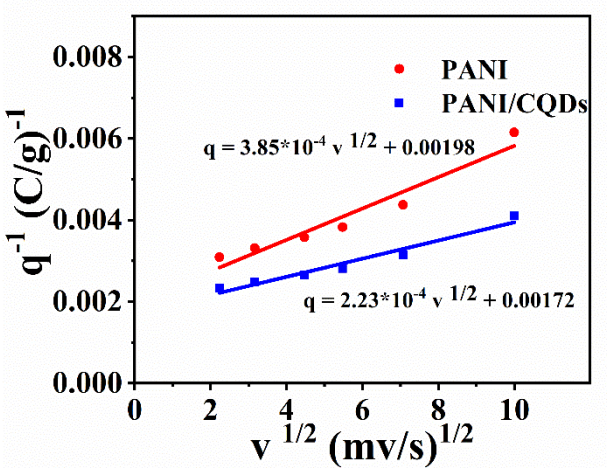


Fig. S3 The inverse of the stored charge versus the square root of the scan rate.

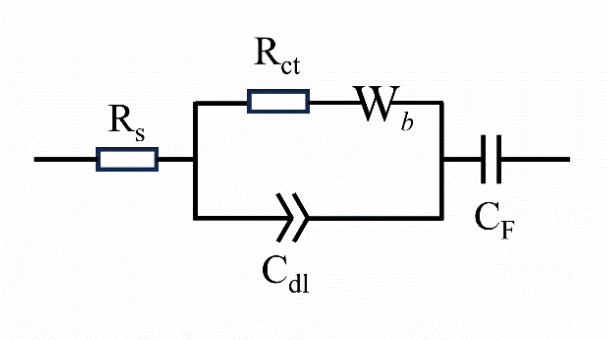


Fig. S4 Equivalent circuit of CNFs/PANI/CQDs electrode.

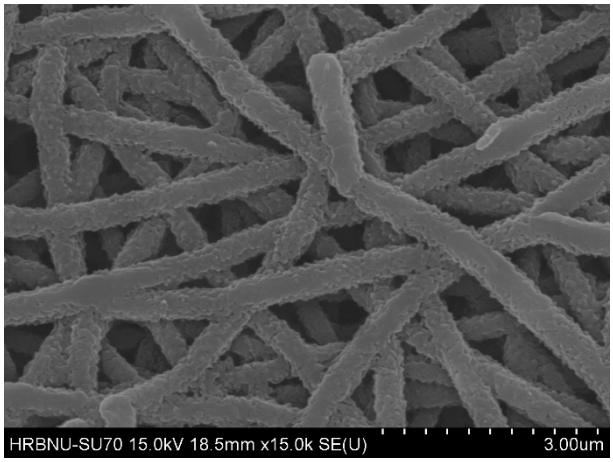
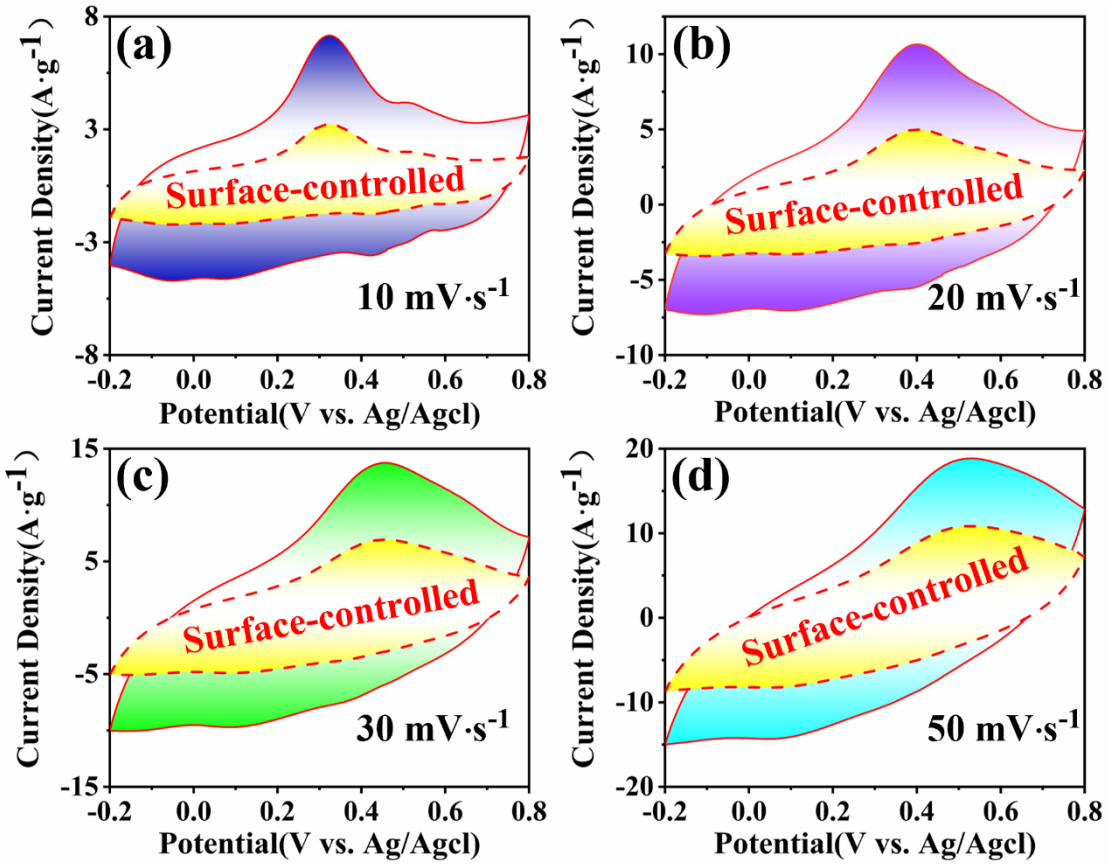


Fig. S5 SEM image of CNFs/PANI/CQDs free-standing electrode after electrochemical tests.



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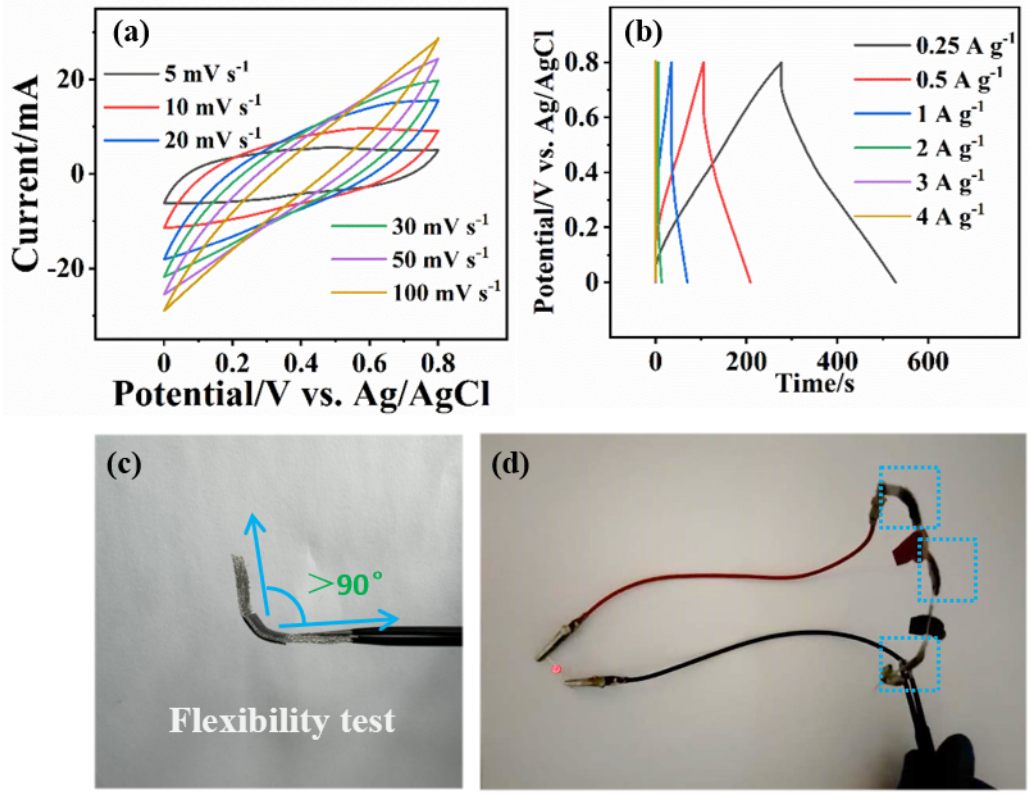

Fig. S7 (a) CV curves, (b) GCD data, and (c) image of the symmetric SSC after mechanical bending, (g) along with its application in red LED lighting.

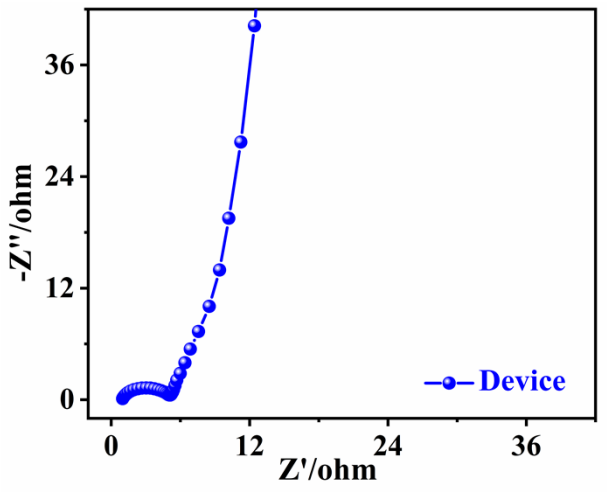

Fig. S8 The Nyquist curves of the symmetric SSC.

Table S1 Capacitance values of the CNFs/PANI/CQDs electrode and cycling ability of symmetric SSC contrast of relevant reports.

Electrodes	Electrolyte	Specific capacitance	Cycle life (symmetric SSC)	Ref.
PANI-CQDs-2	1 M H_2SO_4	871 F g^{-1} (at 0.4 A g^{-1})	85.0 % (5000^{th} at 3 mA cm^2)	[9]
CQD@PANI	1 M H_2SO_4	222.7 F g^{-1} (at 1 A g^{-1})	87.7 % (500^{th} at 1 A g^{-1})	[16]
FMWCNTs@CQDs@PANI	1 M H_2SO_4	534 F g^{-1} (at 0.5 A g^{-1})	——	[18]
N-CDs@PANI	1 M H_2SO_4	785 F g^{-1} (at 0.5 A g^{-1})	——	[19]
C-dots/PANI	1 M H_2SO_4	264.6 F g^{-1} (at 2.5 A g^{-1})	——	[20]
PANI@CNFs	1 M H_2SO_4	285 C g^{-1} (at 0.5 A g^{-1})	81.0 % (1000^{th} at 10 A g^{-1})	[29]
PANI/CNF/GNP	1 M H_2SO_4	421.5 F g^{-1} (at 1 A g^{-1})	78.3 % (1000^{th} at 8 A g^{-1})	[31]
CNFs/PANI	1 M H_2SO_4	325 F g^{-1} (at 0.5 A g^{-1})	80.0 % (6000^{th} at 1 A g^{-1})	[35]
CD@PANI-0.5	0.5 M Na_2SO_4	609 F g^{-1} (at 0.5 A g^{-1})	——	[38]
CQDs-PANI/CFs	1 M H_2SO_4	738.3 F g^{-1} (at 1 A g^{-1})	——	[41]
PANI-C	1 M H_2SO_4	455.7 F g^{-1} (at 0.5 A g^{-1})	86.0 % (2500^{th} at 5 A g^{-1})	[45]
CNFs/PANI/CQDs	**1 M H_2SO_4**	**756.5 F g^{-1} (at 0.5 A g^{-1})**	**81.25 % (10000^{th} at 1 A g^{-1})**	**this work**