GQD-PAN based high-performance supercapacitor – an approach towards wealth from waste

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ELECTROCHEMICAL STUDIES

Table S1 | Areal and volumetric capacitance of neat cPAN based three-electrode system at varying current density values.

Sample	Current Density ($mAcm^{-2}$)	Discharge Time (s)	Potential Window (V)	Area (cm^2)	Weight (mg)	Areal Capacitance (mF/cm^2)	Volumetric Capacitance (F/g)
Neat cPAN	0.8	33	1.1	1	2	24.00	12.00
	1.0	17	1.1	1	2	15.45	7.73
	1.2	9	1.1	1	2	9.82	4.91
	1.4	5	1.1	1	2	6.36	3.18
	1.6	3	1.1	1	2	4.36	2.18

Table S2 | Areal and volumetric capacitance of 0.1 mg GQDs coated cPAN based three-electrode system at varying current density values.

Sample	Current Density ($mAcm^{-2}$)	Discharge Time (s)	Potential Window (V)	Area (cm^2)	Weight (mg)	Areal Capacitance (mF/cm^2)	Volumetric Capacitance (F/g)
0.1 mg GQDs coated cPAN	0.6	1121	1.1	1	2.1	611.45	291.17
	0.8	617	1.1	1	2.1	448.73	213.68
	1.0	321	1.1	1	2.1	291.82	138.96
	1.2	124	1.1	1	2.1	135.27	64.42
	2.0	23	1.1	1	2.1	41.82	19.91

Table S3 | Areal and volumetric capacitance of 0.4 mg GQDs coated cPAN based three-electrode system at varying current density values.

Sample	Current Density ($mAcm^{-2}$)	Discharge Time (s)	Potential Window (V)	Area (cm^2)	Weight (mg)	Areal Capacitance (mF/cm^2)	Volumetric Capacitance (F/g)
0.4 mg GQDs coated cPAN	2.0	1036	1.1	1	2.4	1883.64	784.85
	3.0	516	1.1	1	2.4	1407.27	586.36
	4.0	219	1.1	1	2.4	796.36	331.82

Table S4 | Areal and volumetric capacitance of 0.1 mg GQDs coated cPAN based two-electrode system at varying current density values.

Sample	Current Density ($mAcm^{-2}$)	Discharge Time (s)	Potential Window (V)	Area (cm^2)	Weight (mg)	Areal Capacitance (mF/cm^2)	Volumetric Capacitance (F/g)
0.1 mg GQDs coated cPAN	0.4	289.00	1.1	1.76	3.7	59.71	28.40
	0.6	155.88	1.1	1.76	3.7	48.31	22.98
	0.8	93.67	1.1	1.76	3.7	38.71	18.41
	1.0	59.69	1.1	1.76	3.7	30.83	14.67
	2.0	5.67	1.1	1.76	3.7	5.86	2.79

Table S5 | Energy density and power density of neat cPAN, 0.1 and 0.4 mg GQDs coated cPAN based three-electrode system, 0.1 mg GQDs coated two-electrode system at varying current density values.

Neat cPAN		0.1 mg GQDs coated three-electrode		0.4 mg GQDs coated three-electrode		0.1 mg GQDs coated two-electrode	
Energy Density ($\mu Whcm^{-2}$)	Power Density (μWcm^{-2})	Energy Density ($\mu Whcm^{-2}$)	Power Density (μWcm^{-2})	Energy Density ($\mu Whcm^{-2}$)	Power Density (μWcm^{-2})	Energy Density ($\mu Whcm^{-2}$)	Power Density (μWcm^{-2})
102.76	330	4.03	440	316.56	1100	10.03	125
75.41	440	2.60	550	236.50	1650	8.12	187.5
49.04	550	1.65	660	133.83	2200	6.50	250
22.73	660	1.07	770	116.88	2750	5.18	312.5
7.03	1100	0.73	880	76.08	3300	0.98	625

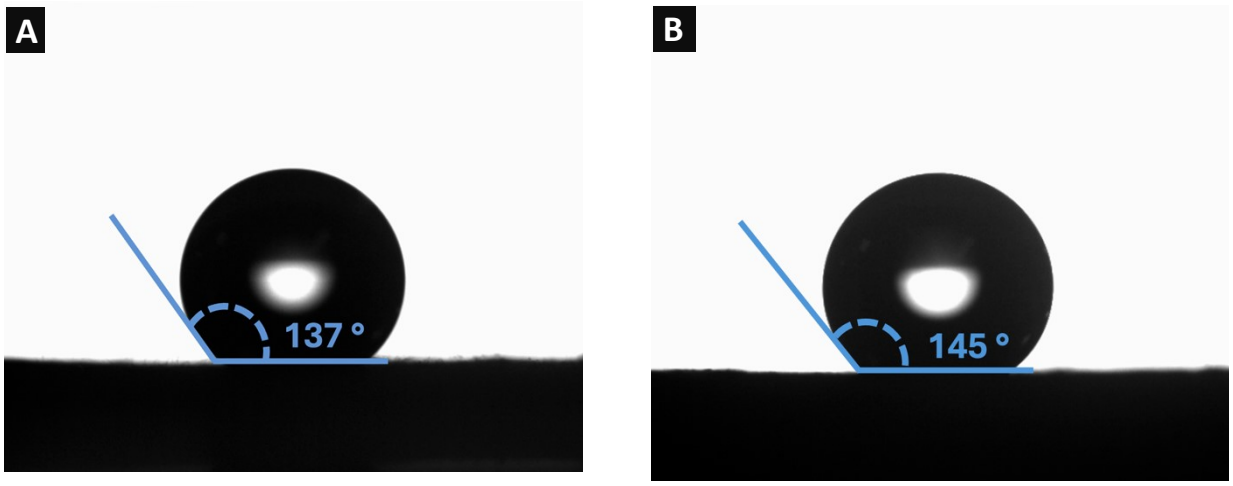

Figure S1 | Contact angle measurement of (A) neat cPAN fibre (137°) and (B) GQDs coated cPAN (145°).

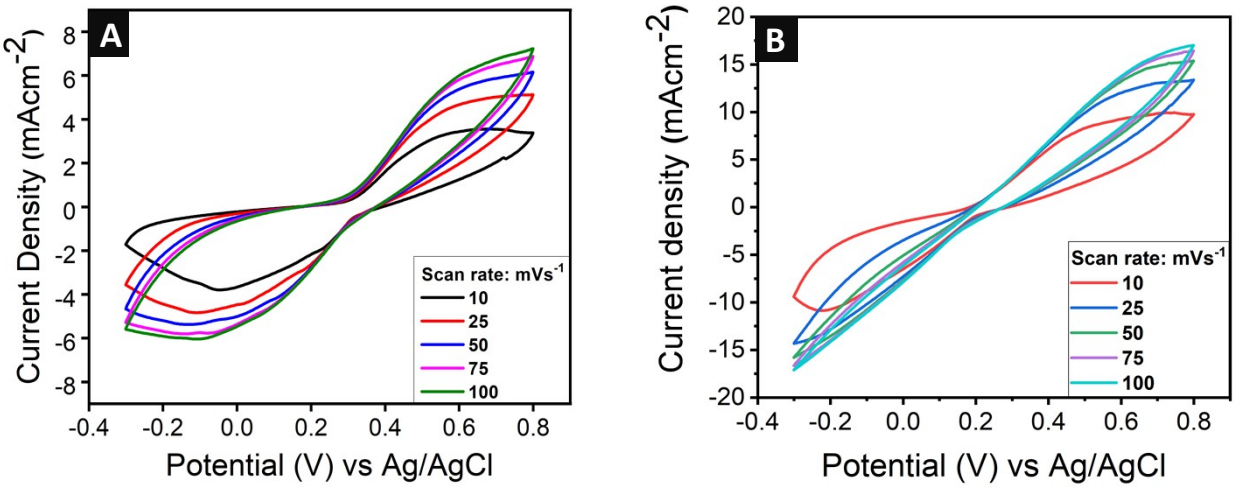

Figure S2 | (A) CV curves of 0.4 mg GQDs coated cPAN matrices collected under various scan rates. (B) CV curves of 0.1 mg GQDs coated cPAN matrix collected under various scan rates.

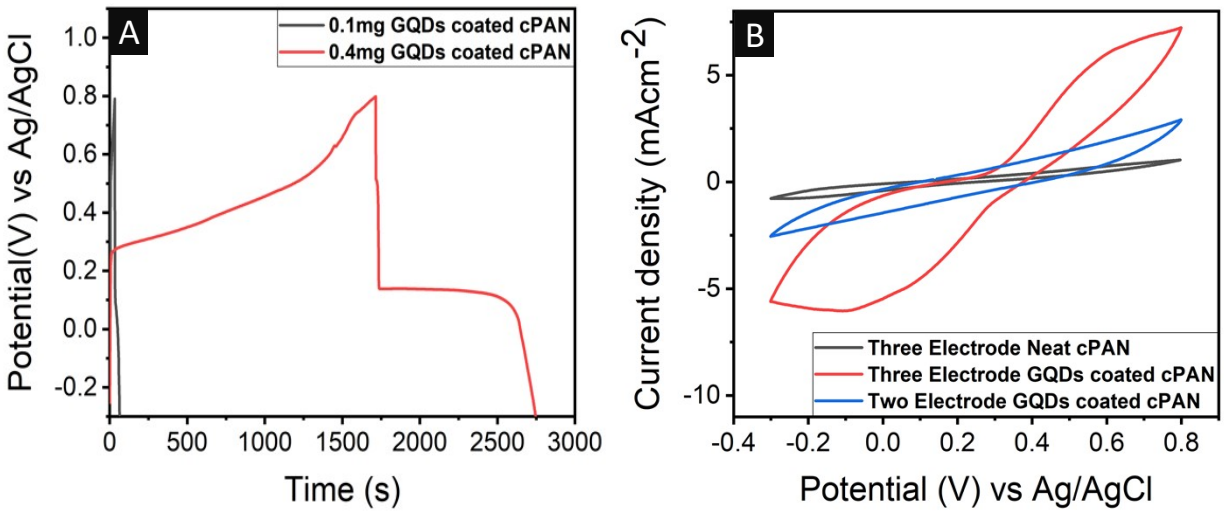

Figure S3 | (A) GCD curve collected for 0.1 mg and 0.4 mg GQDs coated cPAN matrices. (B) CV curves of neat cPAN and 0.1 mg GQDs coated cPAN matrices collected with three- and two-electrode system-based supercapacitor.

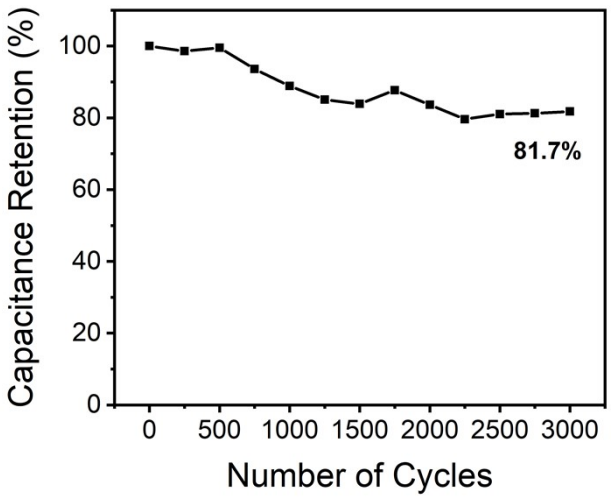

Figure S4 | 0.1 mg GQDs coated cPAN matrix capacitance retention for 3000 cycles in three-electrode supercapacitor.

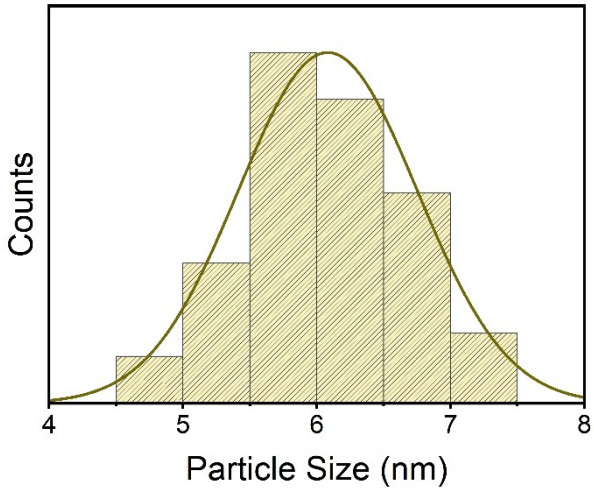

Figure S5 | GQDs particle size distribution graph calculated form TEM image.

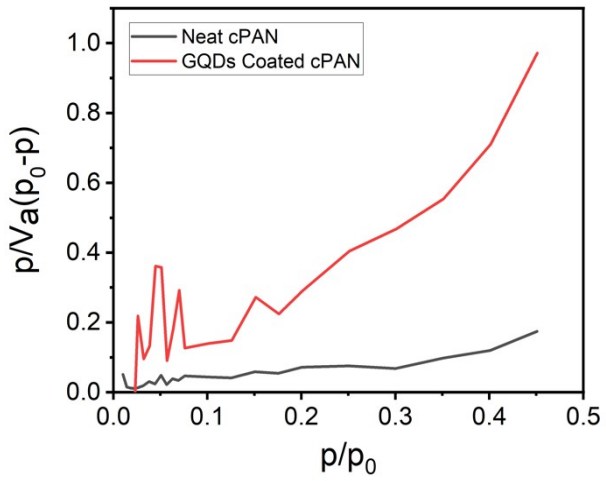

Figure S6 | BET (Brunauer-Emmett-Teller) of neat cPAN and GQDs coated cPAN fibre.

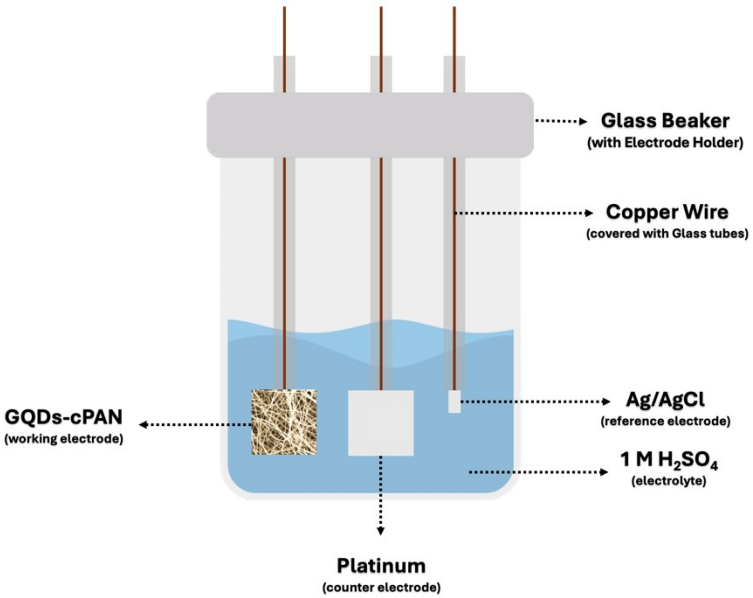

Figure S7 | Schematic of the three-electrode electrochemical system.