



PAPER

A new redox phloroglucinol additive incorporated gel polymer electrolyte for flexible symmetrical solid-state supercapacitor

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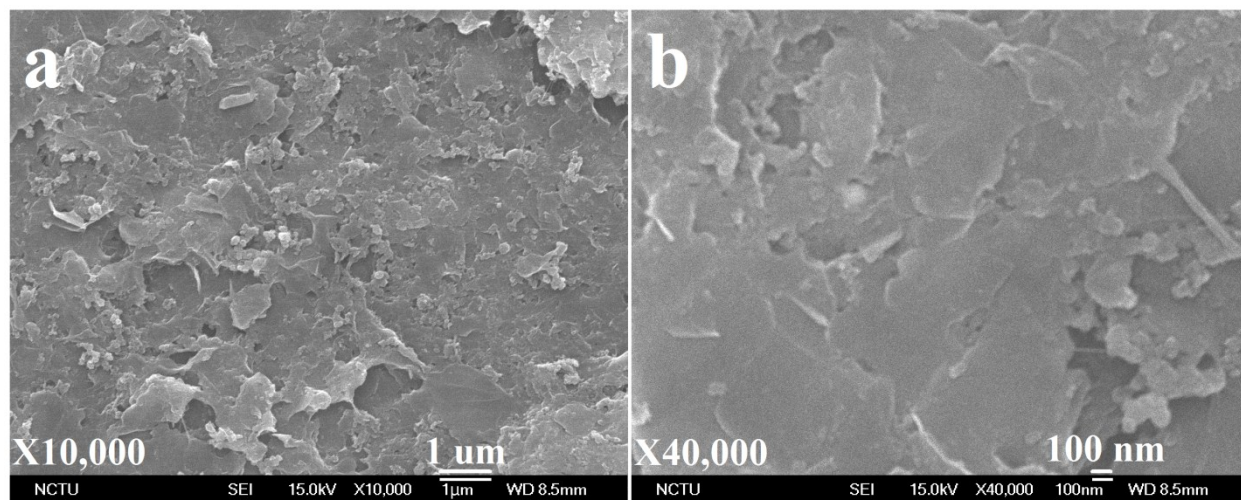


Figure S1 SEM images of nitrogen-doped graphene nanosheets electrodes before electrochemical characterization at various magnifications.

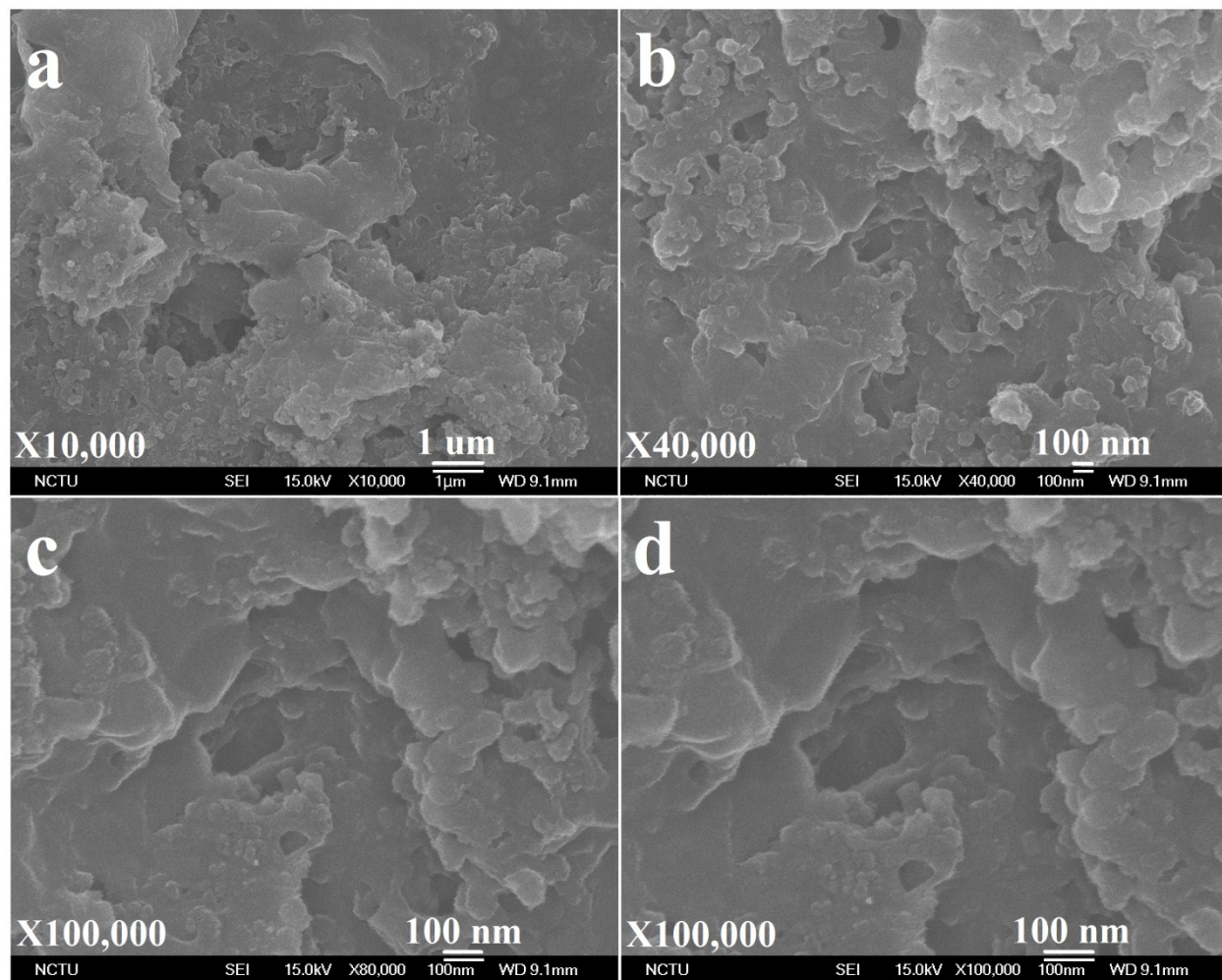


Figure S2 SEM images of nitrogen-doped graphene nanosheets electrodes after electrochemical characterization at various magnifications.

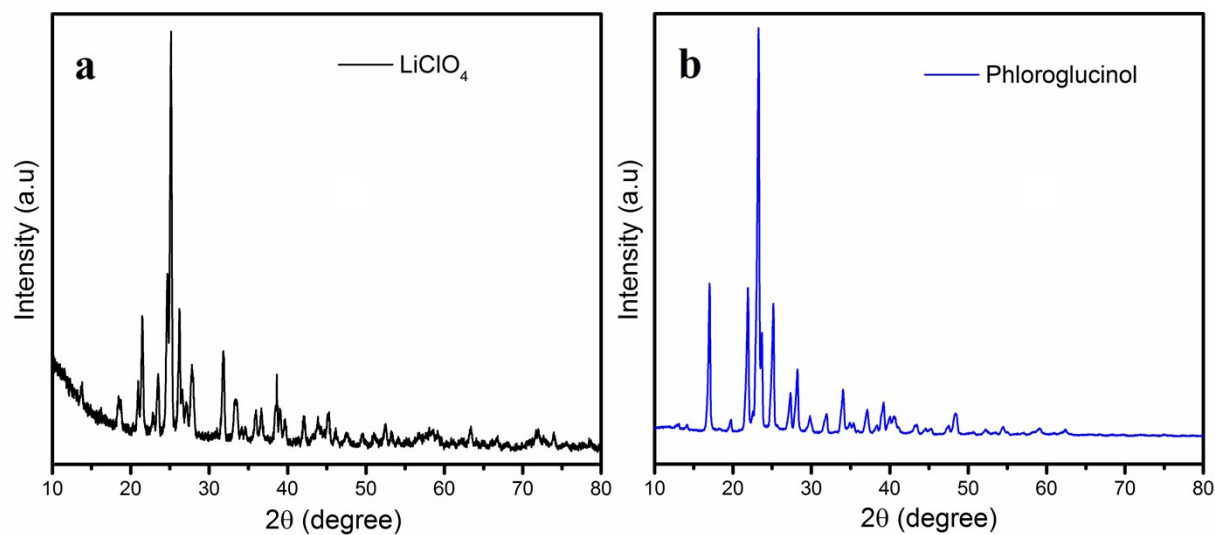


Figure S3 XRD patterns of (a) commercial LiClO_4 and (b) phloroglucinol.

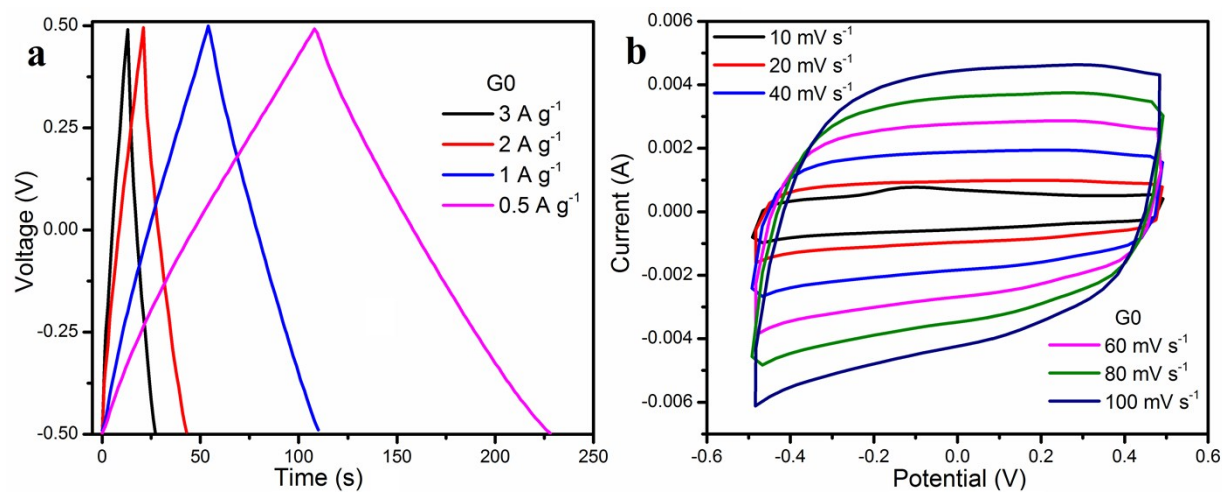


Figure S4 (a) GCD curves of G0 at various current densities and (b) CV curves of G0 at various scan rates.

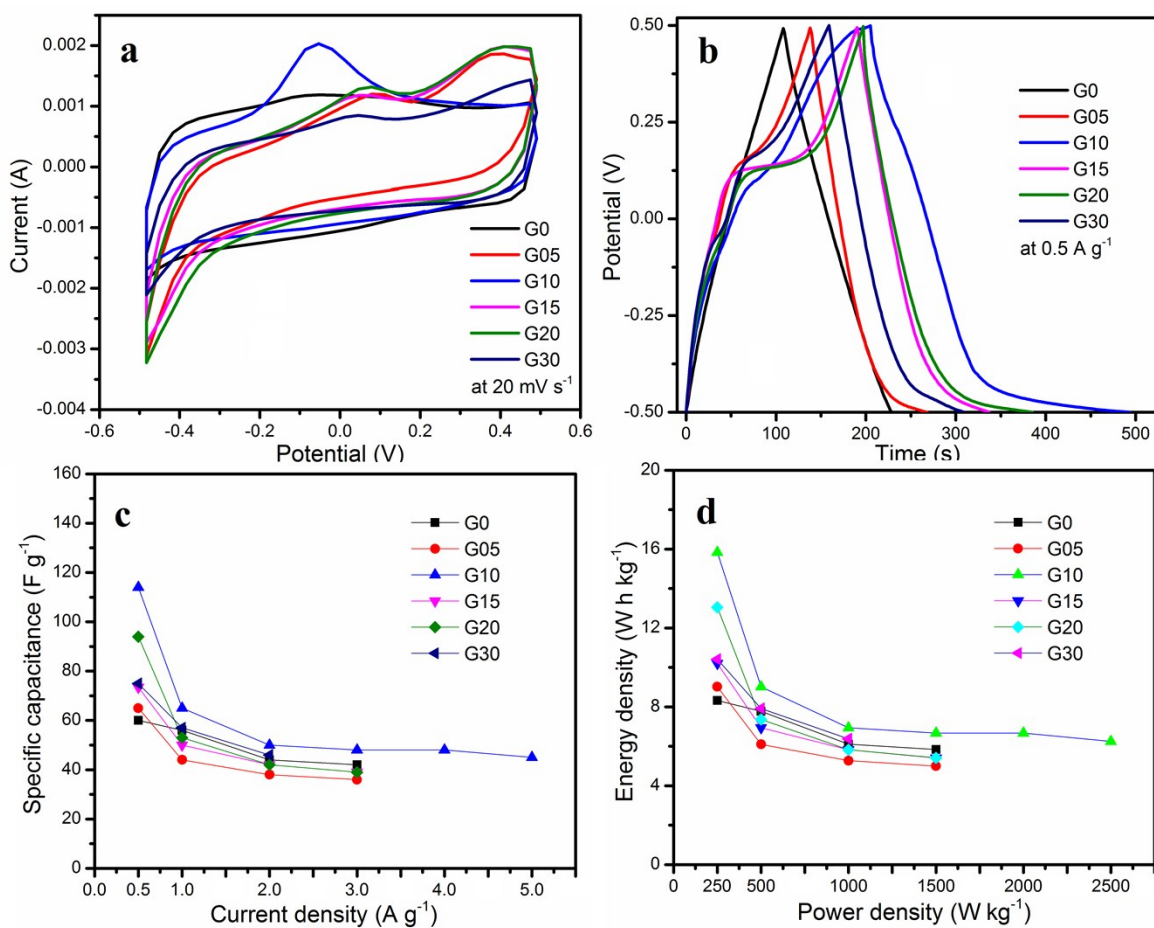


Figure S5 Electrochemical properties of G0, G05, G10, G15, G20 and G30 measured in three electrode system: (a) CV curves, (b) GCD curves, (c) specific capacitance at various current densities, and (d) Ragone plots.

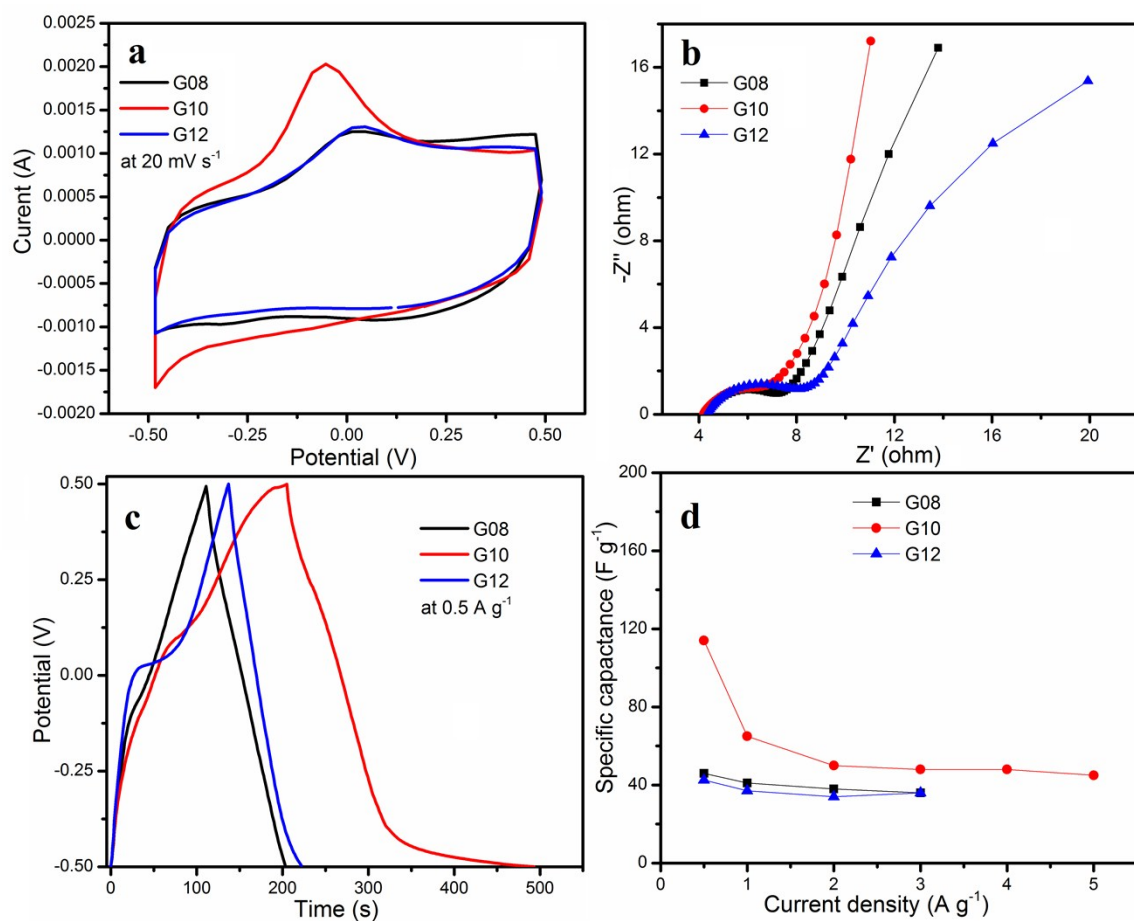


Figure S6 Electrochemical properties of G08, G10 and G12 measured in three electrode system:

(a) CV curves, (b) EIS plots, (c) GCD curves and (d) specific capacitance at various current densities.

Table S1 Coulombic efficiency of graphene composite electrode in G0 gel polymer electrolyte at various current densities

Current densities (A/g)	Charge time (s)	Discharge time (s)	Coulombic efficiency (%)
3	13	13	100
2	21	21	100
1	54	56	103.7
0.5	108	120	111.11

Table S2 Coulombic efficiency of graphene composite electrode in G10 gel polymer electrolyte at various current densities

Current densities (A/g)	Charge time (s)	Discharge time (s)	Coulombic efficiency (%)
5	10	10	100
4	13	12	92.3
3	17	17	100
2	28	25	89.3
1	70	70	100
0.5	205	288	140.5

Table S3 A summary of electrode materials and electrolytes for making supercapacitors

Electrode materials	Electrolyte	Current density	Specific capacitance	Ref.
CNT	(PS-PEO-PS)-[EMIM][NTf ₂] (C-TRI)	-	20 mF/cm ²	13
MWCNT	Methylene blue	8.84 mA/cm ²	23 F/g	20
Activated carbon	PVA-PVP-H ₂ SO ₄ -MB	1 A/g	328 F/g	21
Activated carbon	m-phenylene-diamine-KOH	0.5 A/g	78.01 F/g	22
MWCNT	Indigo carmine-H ₂ SO ₄	8.8 mA/cm ²	50 F/g	23
Activated carbon	PVA-H ₂ SO ₄ -Indigo carmine	1 A/g	382 F/g	27
Activated carbon	PVA-H ₂ SO ₄ -alizarin red S	0.5 A/g	441 F/g	31
N-graphene	PVA-LiClO ₄ -phloroglucinol	0.5 A/g	114 F/g	This work

CNT: Carbon Nanotube

(PS-PEO-PS): Poly(styrene-block-ethylene oxide-block-styrene)

MWCNT: Multi-Walls Carbon Nanotube