Supporting information

3D porous graphene nanostructure from a simple, fast, scalable process for high performance flexible gel-type supercapacitors

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10 pages, 6 figures, and 3 tables.

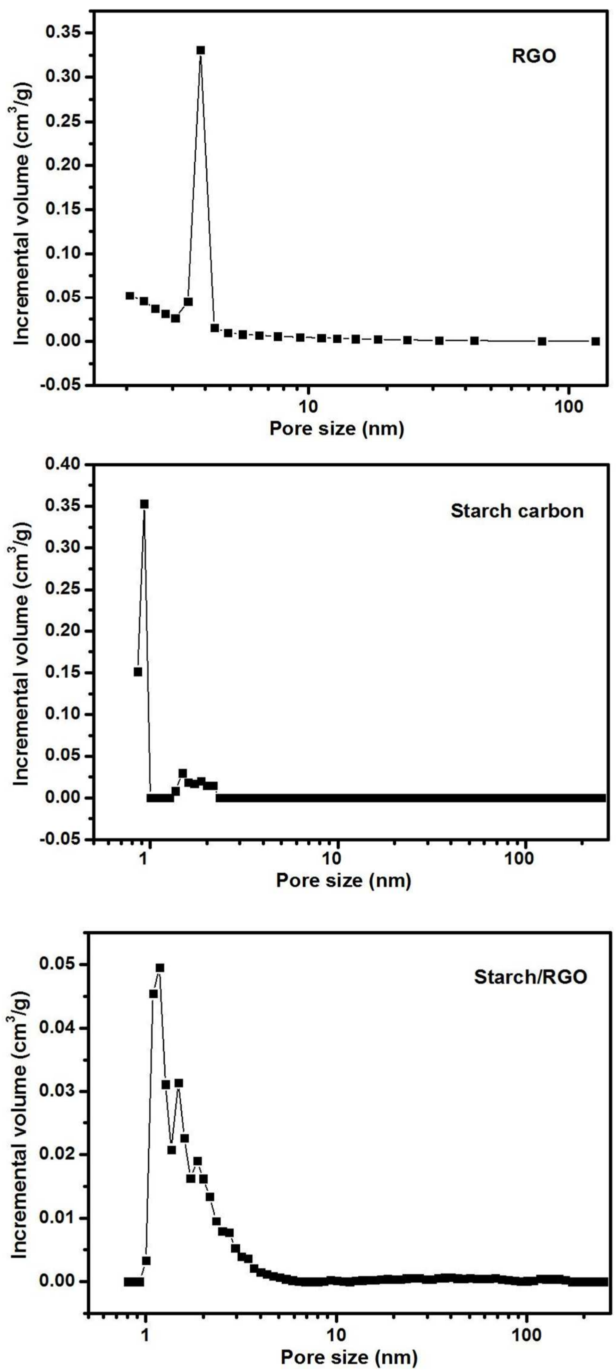


Figure S1. Pore size distributions of RGO, starch carbon, and starch/RGO. Pore size distribution of RGO was obtained with Barrett-Joyner-Halenda model, whereas those of starch carbon and starch/RGO were obtained with DFT model.

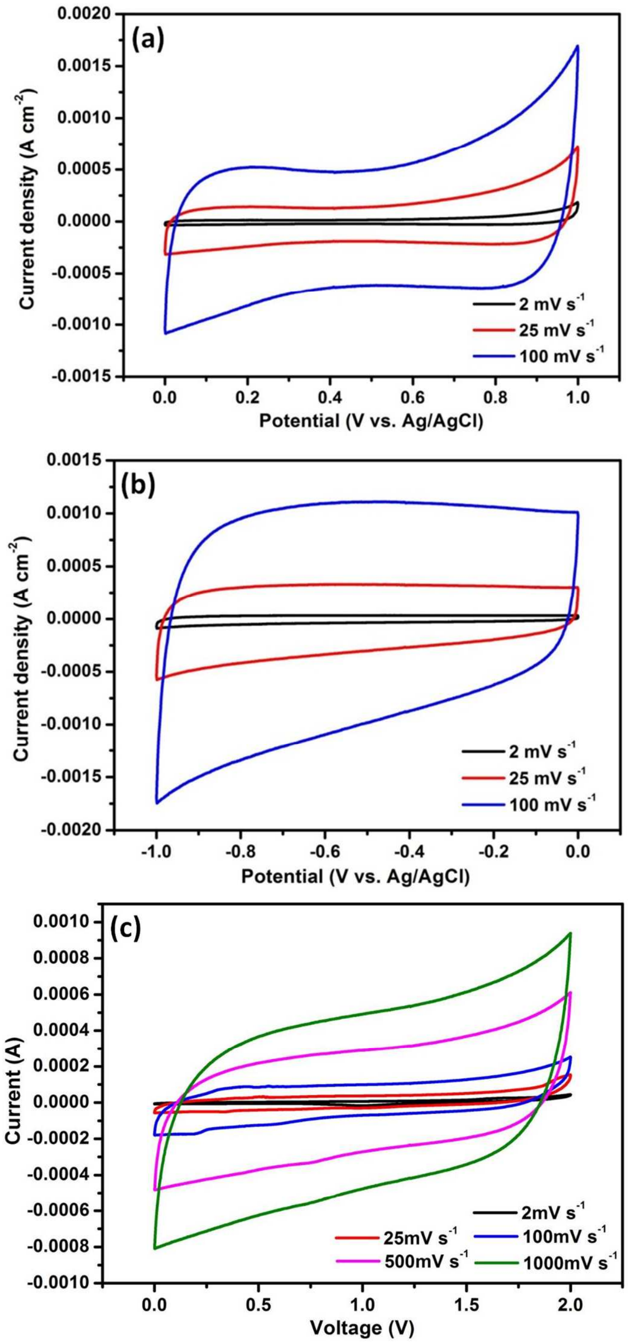


Figure S2. CVs of RGO electrode at increasing scan rates in LiCl/PVA gel electrolyte recorded in (a) positive and (b) negative potential windows. (c) CVs of RGO//RGO supercapacitor at increasing scan rates in LiCl/PVA gel electrolyte.

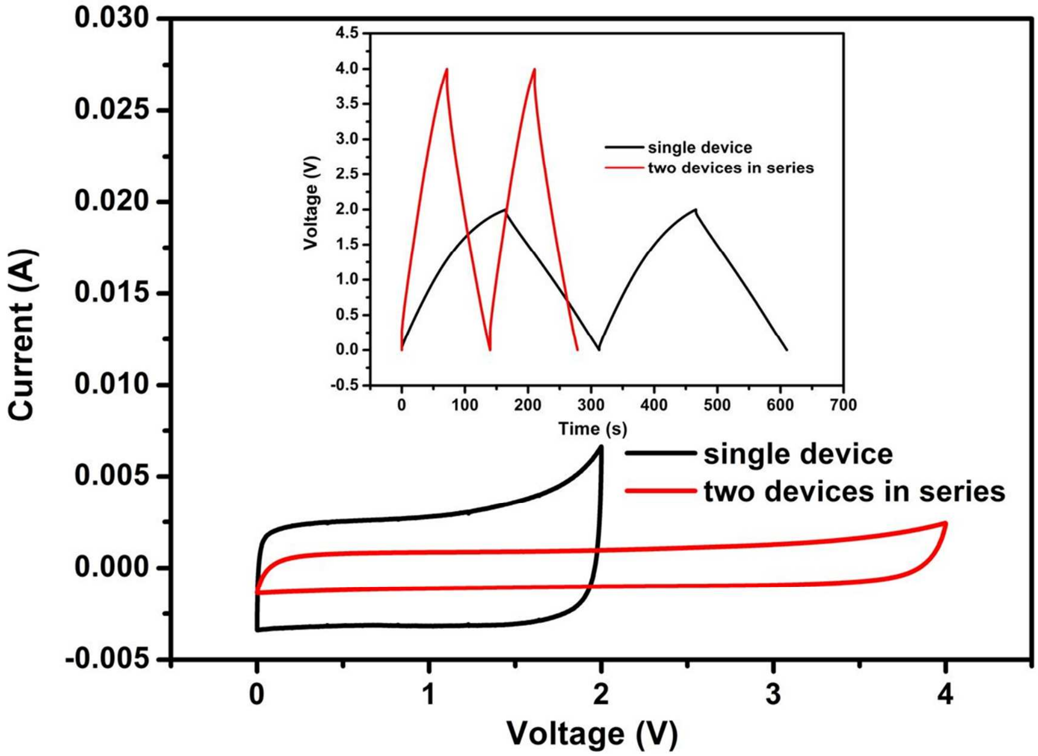


Figure S3. CV of two starch/RGO//starch/RGO capacitors connected in serial at 25 mV s^{-1}. Inset shows corresponding galvanostatic charge/discharge curves at 2 mA.

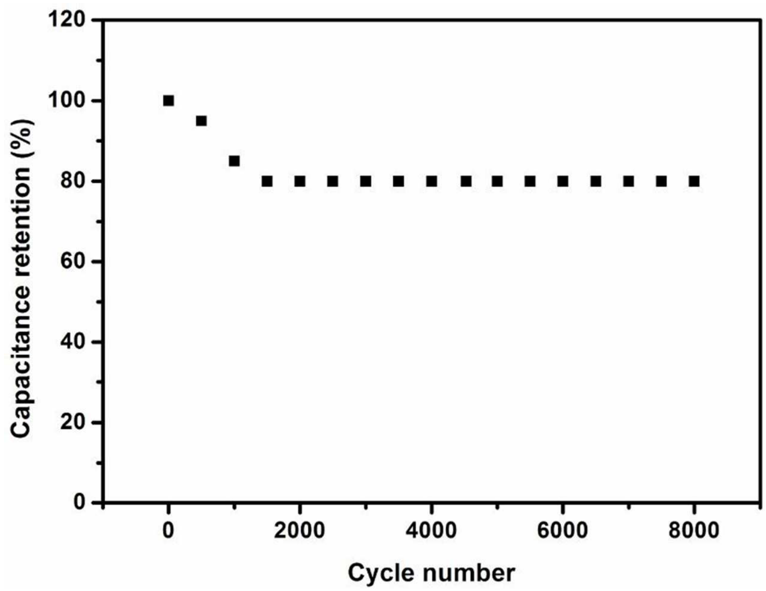


Figure S4. Cycling stability of starch/RGO//starch/RGO supercapacitor in LiCl/PVA gel electrolyte. The capacitance data were obtained from galvanostatic charge/discharge at 10 A g^{-1}.

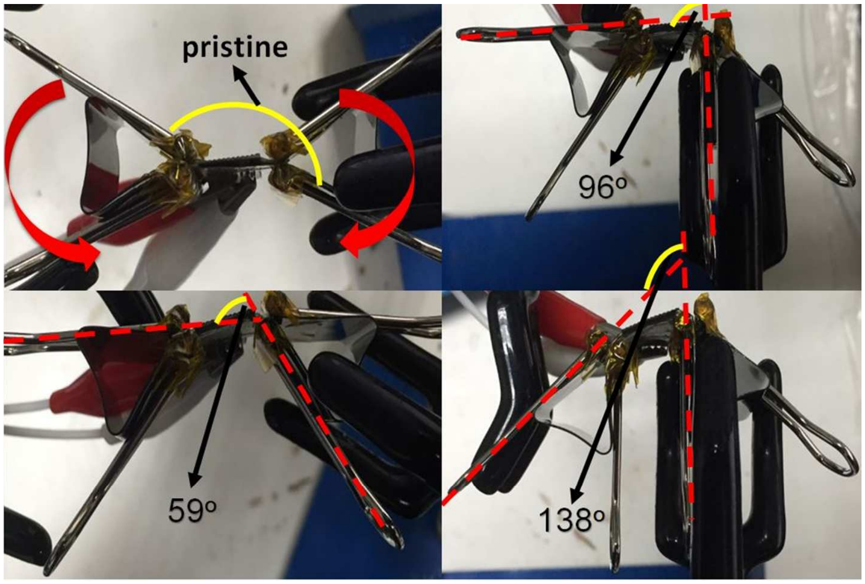
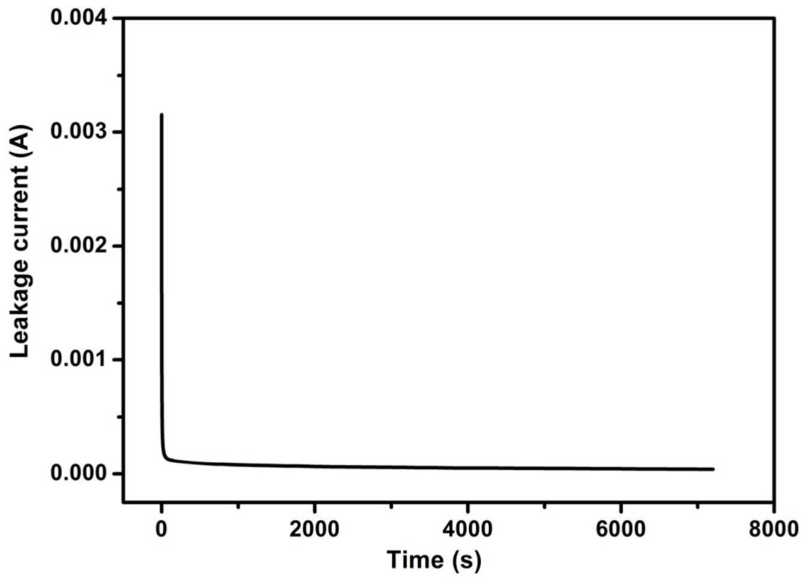


Figure S5. Photographs illustrate flexible starch/RGO//starch/RGO supercapacitor under increasing bending angles.

(a)



(b)

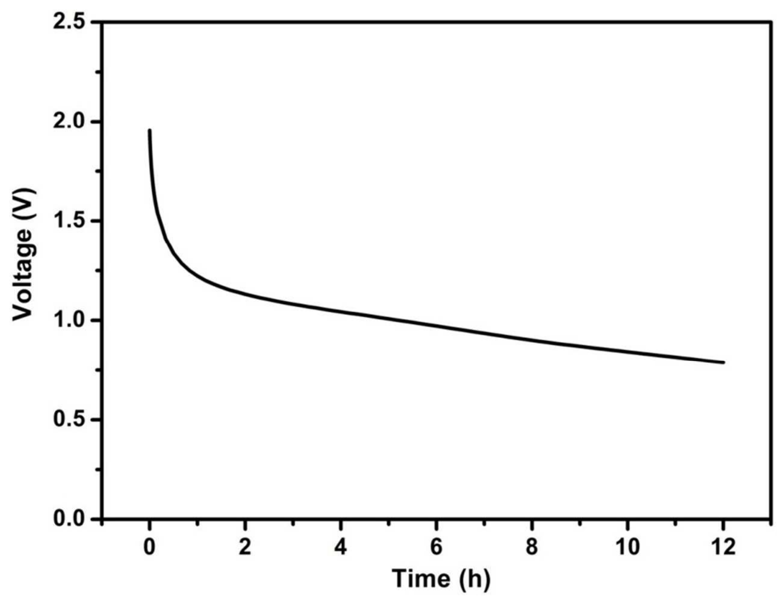


Figure S6. (a) Leakage current of starch/RGO//starch/RGO capacitor charged at 2 mA to 2 V and kept at 2 V for 2 h and (b) self-discharge curve of starch/RGO//starch/RGO capacitor after charging at 2 V for 300 s.

Table S1. Specific surface areas, pore volumes, and average pore sizes of starch carbon, RGO, and starch/RGO materials.

	Specific surface area (m^2 g^{-1})	**Total pore volume (cm^3 g^{-1})**	**Average pore size (nm)**
starch carbon	1706	0.76	1.8
RGO	325	0.38	4.8
starch/RGO	1519	0.75	2.0

Table S2. Energy and power densities of starch/RGO//starch/RGO supercapacitors at increasing bending angles at scan rate of 100 mV s^{-1}.

	Flat	Bending at 59°	Bending at 96°	Bending at 138°	Return to flat
Energy density ($Wh\ kg^{-1}$)	16.7	13.5	15.0	15.0	14.9
Power density ($kW\ kg^{-1}$)	3.0	2.4	2.7	2.7	2.7

Table S3. Energy and power densities of starch/RGO//starch/RGO supercapacitors at increasing working temperatures at scan rate of 100 mV s^{-1}.

	-21°C	**3°C**	**24°C**	**40°C**	**60°C**	**80°C**	**100°C**
Energy density ($Wh\ kg^{-1}$)	12.8	14.0	14.9	15.8	16.3	16.9	15.3
Power density ($kW\ kg^{-1}$)	2.3	2.5	2.7	2.9	2.9	3.0	2.8