Supporting Information

Carbons Derived from Alcohol-Treated Bacterial Cellulose with Optimal Porosity for Li-O_2 Batteries

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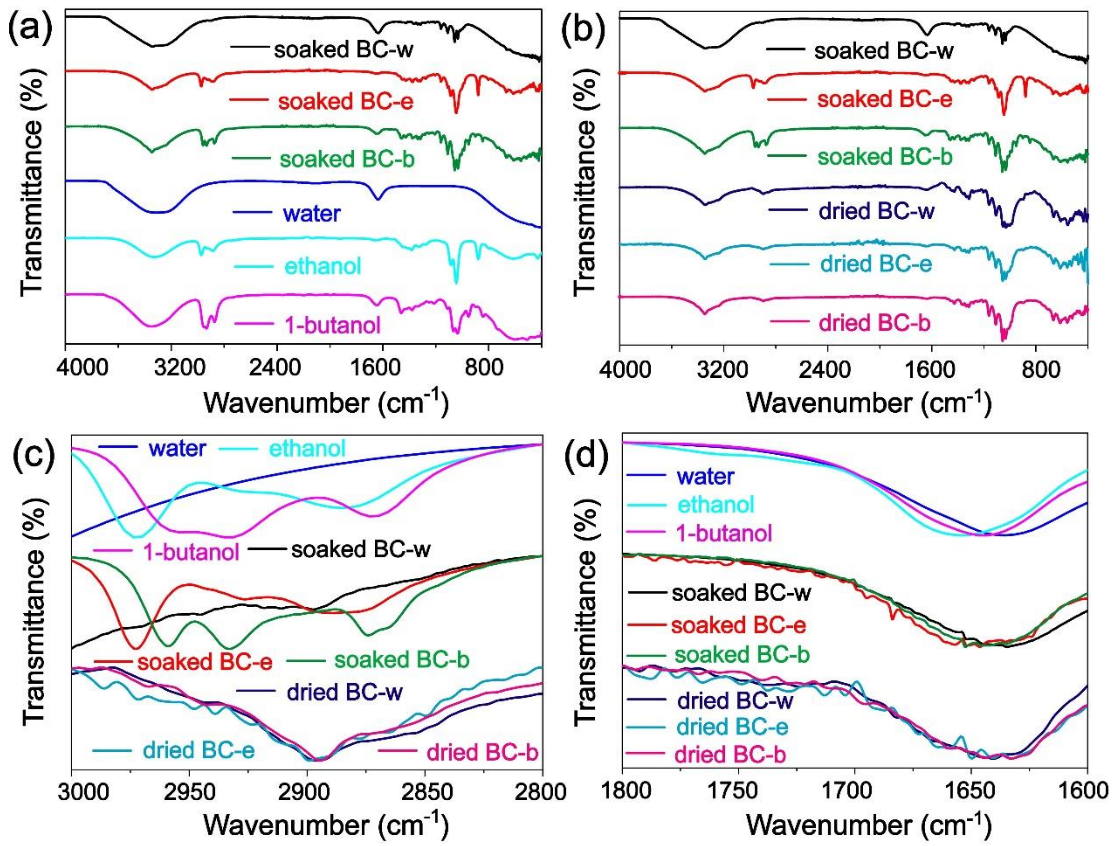

Fig. S1. (a) FTIR of soaked BCs and pure solvents; (b) FTIR of soaked BCs and dried BCs; (c) zooming at 3000–2800 cm^{-1} and (d) 1800–1600 cm^{-1} for all samples.

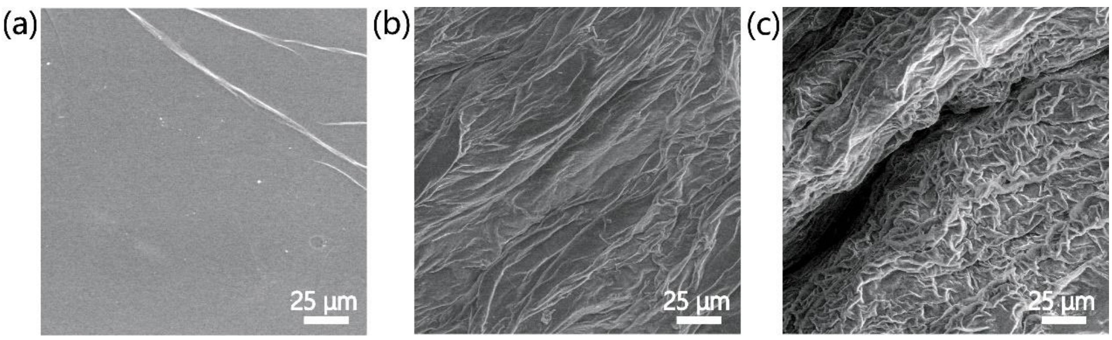

Fig. S2. SEM surface images of dried BC-w (a), BC-e (b) and BC-b (c)

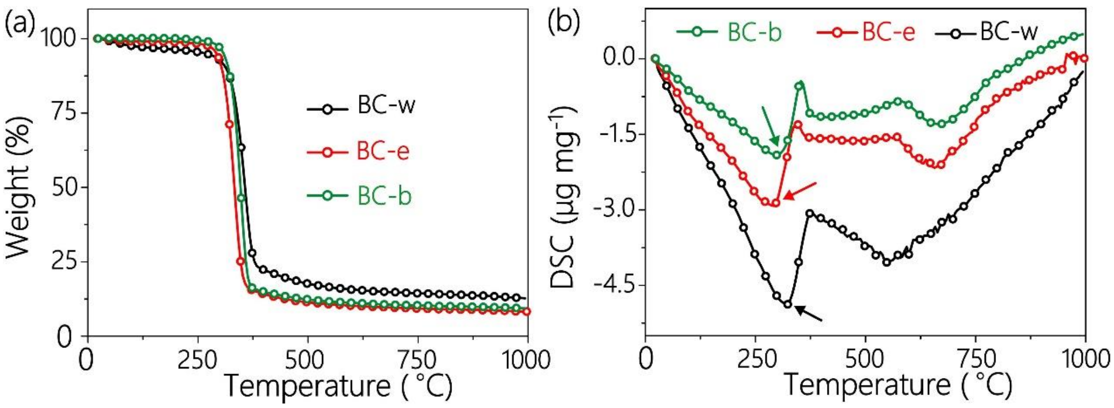

Fig. S3. (a) TGA of dried BCs; (b) DSC of dried BCs

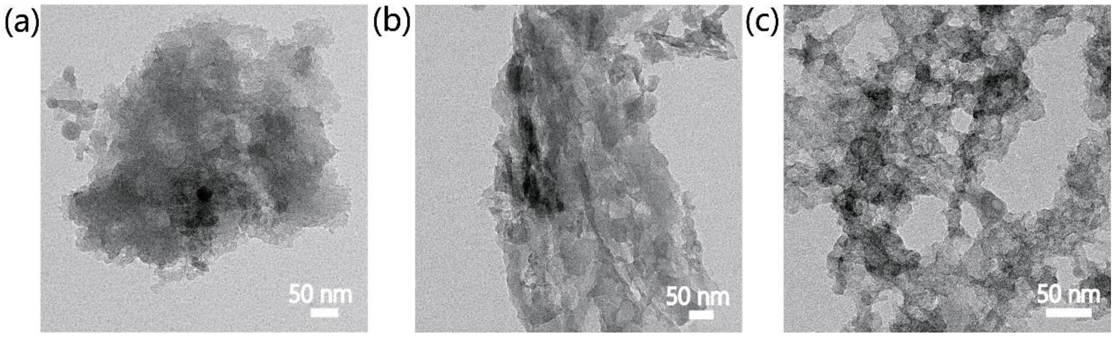

Fig. S4. TEM images of carbon-w (a), carbon-e (b) and carbon-b (c)

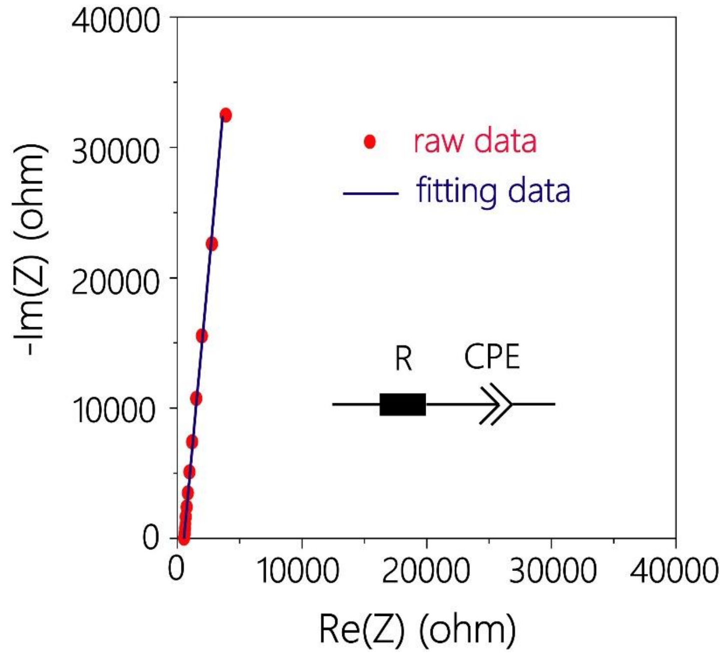

Fig. S5. EIS of a bare glassy carbon electrode at the open circuit potential in 1 M lithium triflate (DEGDME) with saturated Ar. The continuous line is the result of fitting data with the equivalent circuit shown in the insert (R is a resistor and CPE is a constant phase element), from which the parameters R=532.4 ohm, Q=1.573e-6 F·s$^{(\alpha-1)}$, α=0.9391 were obtained. The effective capacitance of the constant phase element is given by $C_{eff}=(QR^{1-\alpha})^{1/\alpha}$ where α and Q as CPE parameters, R is the ohmic resistance [1, 2]. From this value we calculate the specific capacitance $C^*=C_{eff}/S_{GC}=14.06$ µF cm^{-2}, where $S_{GC}=0.07$ cm^{-2} is the area of the glassy carbon electrode.

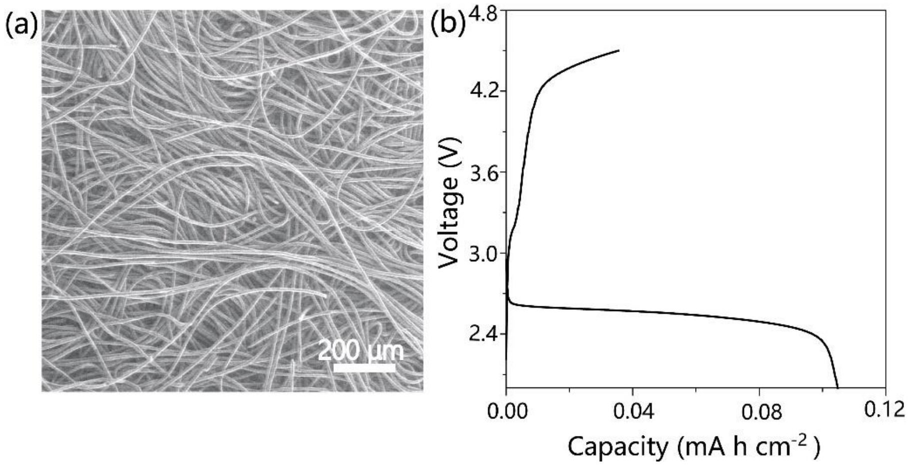

Fig. S6. SEM image (a) and the full discharge-charge profile (b) at 0.1 mA cm^{-2} of bare carbon paper.

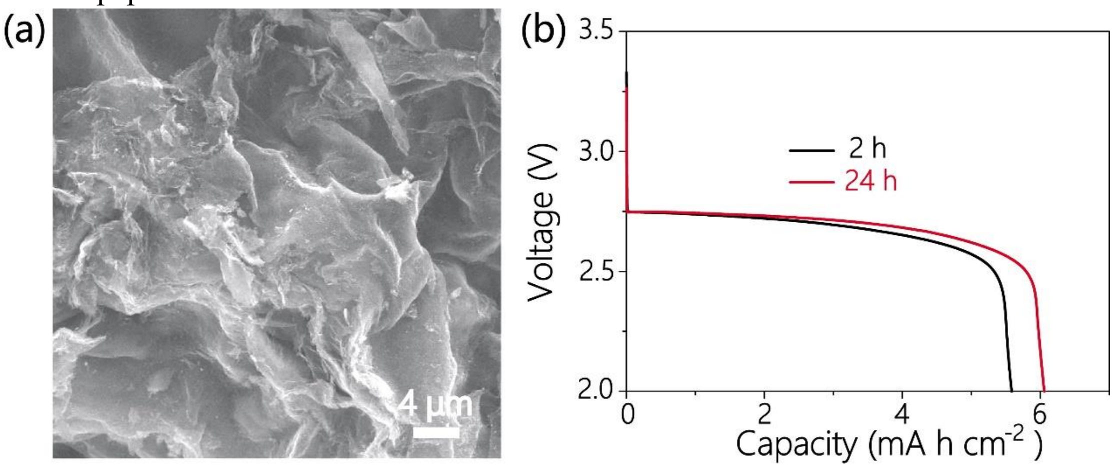

Fig. S7. (a) SEM image of carbon derived from BC soaked 24 h in 1-butanol; (b) comparison of full discharge profiles of carbons derived from BCs soaked in 1- butanol during different time at 0.1 mA cm^{-2}.

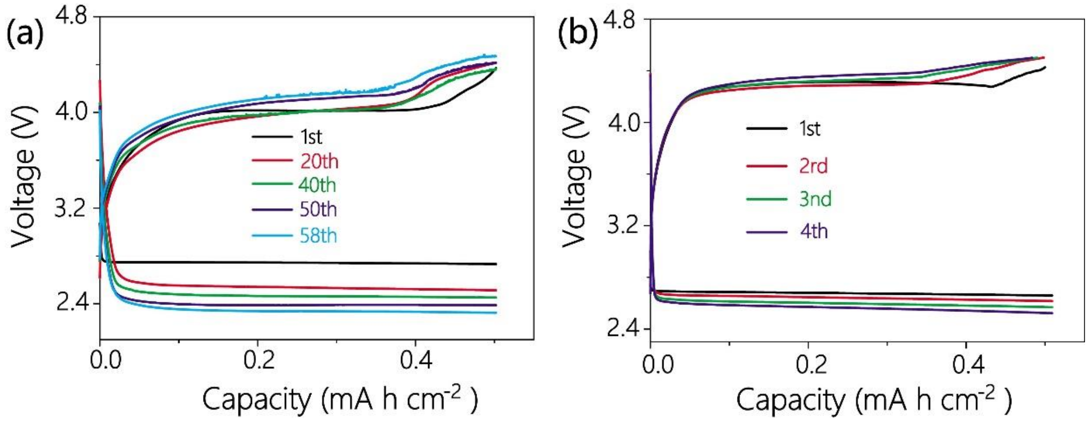

Fig. S8. Discharge-charge profiles of carbon-b and Super P at 0.1 mA cm^{-2}.

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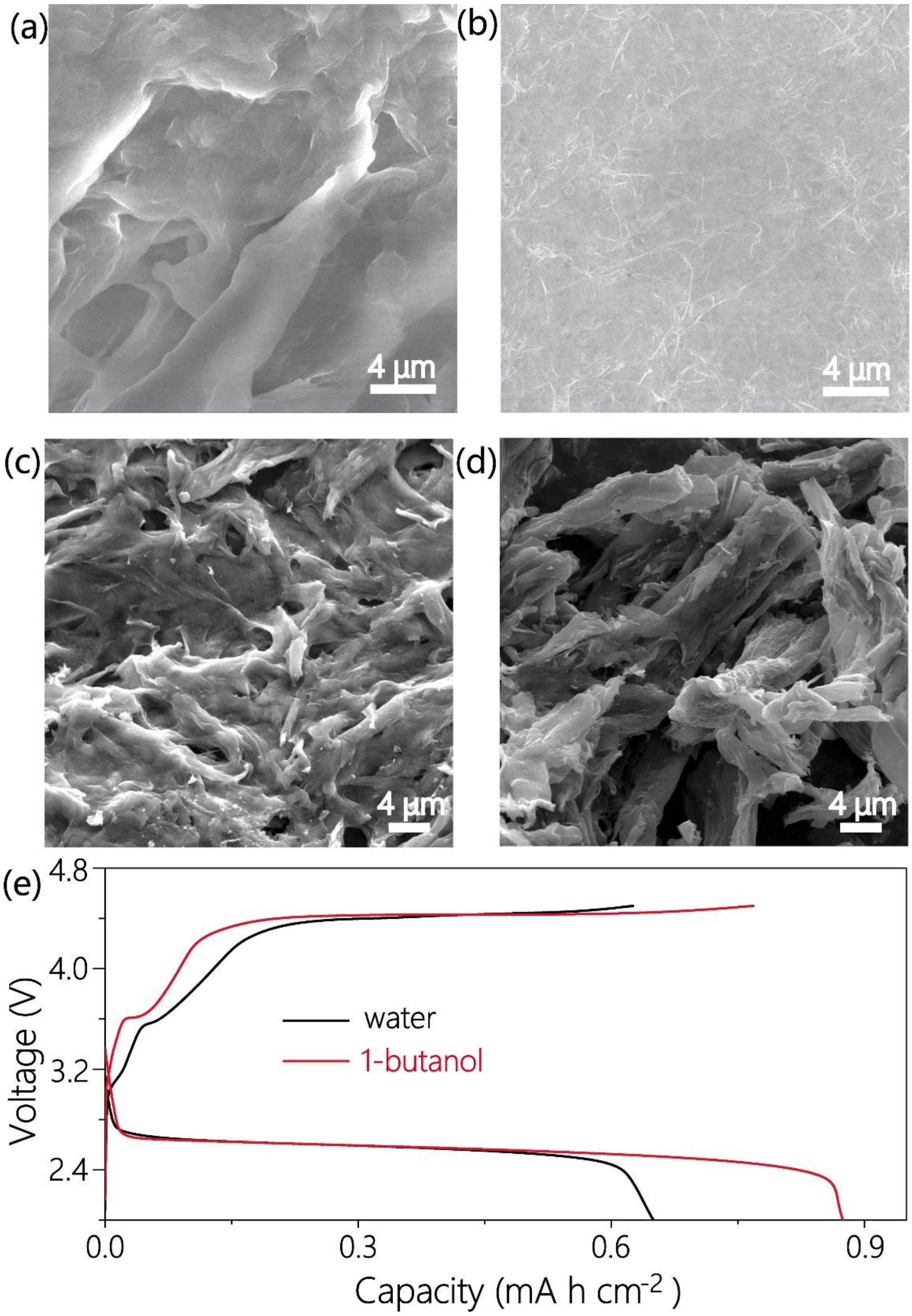

Fig. S9. SEM images of water (a) and 1-butanol (b) treated cotton linters; SEM images of carbons from water treated cotton linters (c) and 1-butanol treated cotton linters (d); (e) full discharge-charge profiles of carbons derived from water and 1-butanol treated cotton linters at 0.1 mA cm^{-2}.

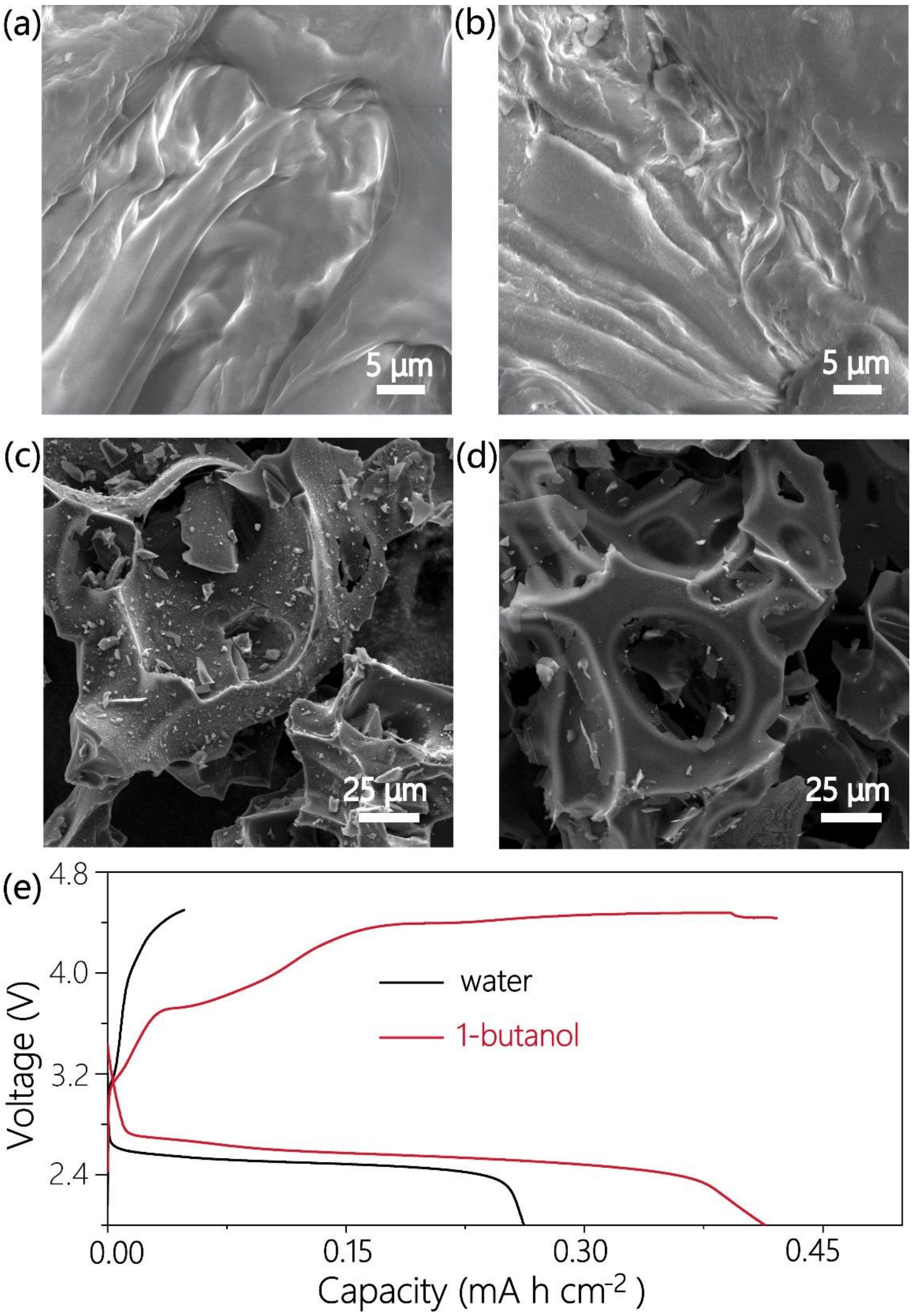

Fig. S10. SEM images of water (a) and 1-butanol (b) treated agarose; SEM images of carbons from water treated agarose (c) and 1-butanol treated agarose (d); (e) full discharge-charge profiles of carbons derived from water and 1-butanol treated agarose at 0.1 mA cm^{-2}.

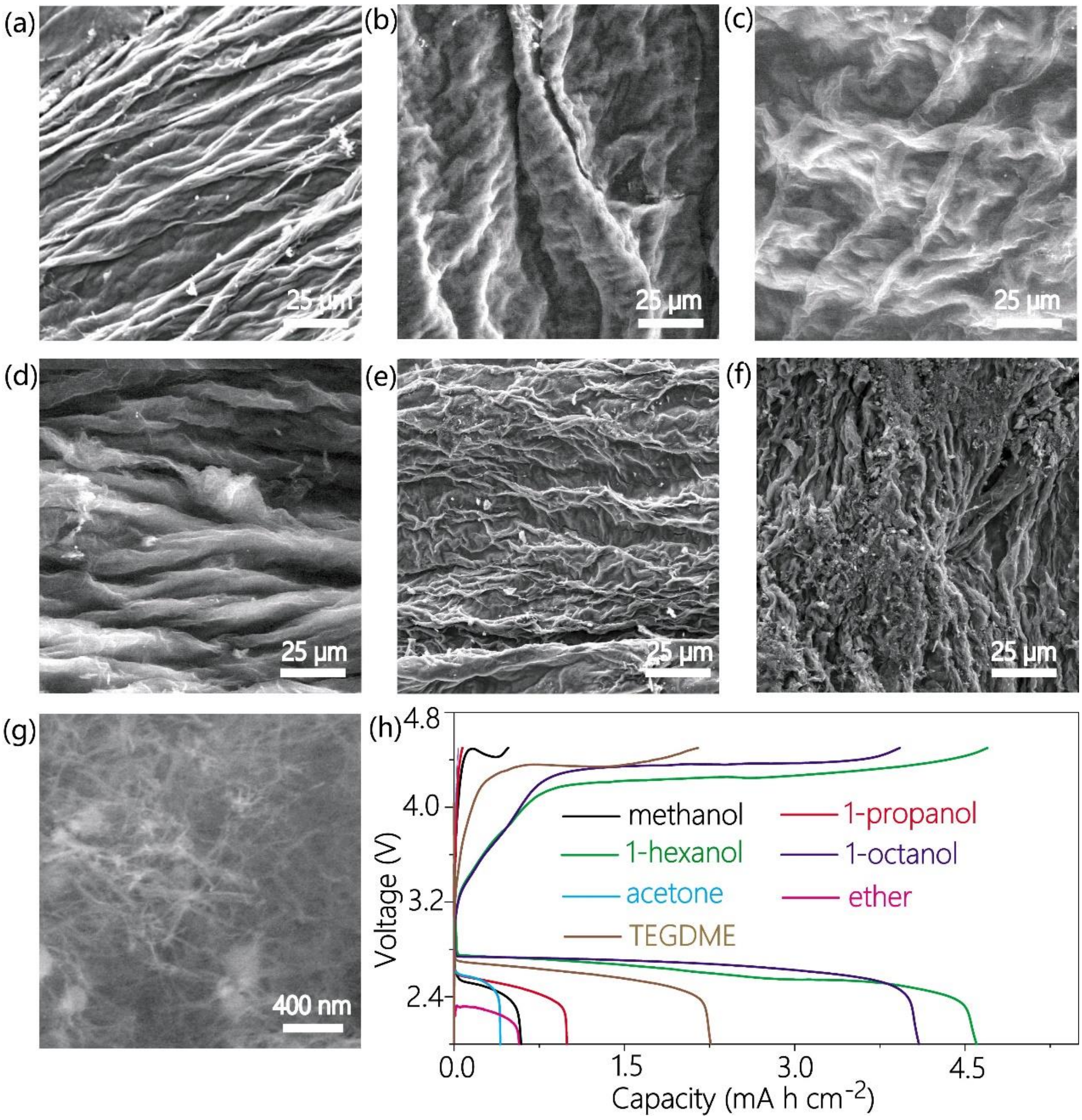

Fig. S11. SEM images of carbons derived from methanol (a), 1-propanol (b), 1-hexanol (c), 1-octanol (d), acetone (e), ether (f) and TEGDME (g) treated BCs; (h) full discharge-charge profiles of carbons derived from different solvents treated BCs.

Table S1. Boiling point, surface tension of solvents[3] and Li-O_2 discharge capacity (at 0.1 mA cm^{-2}) of carbons derived from solvents treated BCs.

Solvents	Boing point (℃)	Surface tension (20 ℃) /(mN m^{-1})	Discharge capacity (mA h cm^{-2})
water	100	72	0.14
methanol	64.51	22.50	0.59
ethanol	78.32	22.27	1.36
1-propanol	97.2	23.70	0.99
1-butanol	117.7	25.00	5.58
1-hexanol	157.1	24.48	4.60
1-octanol	195	26.71	4.09
ether	34.6	17.06	0.57
acetone	56.12	23.32	0.40
TEGDME	216	29.4	2.25

Table S2. Textural data for reported catalyst-free carbons and their discharge capacity when used as cathode in Li–O_2 batteries. Note: the textural data of carbons were collected from carbon powder before processing into electrodes.

Carbon	BET surface area (m^2 g^{-1})	Pore volume (cm^3 g^{-1})	Predominant pore size (nm)	Discharge capacity (mA h cm^{-2})
Carbon b	669	1.25	~85	5.58 (0.1 mA cm^{-2})
HOM-AMUW[4]	451	1.9	~18.5	4.08 (0.1 mA cm^{-2})
CMK-3[5]	789	1.18	~6	5 (0.1 mA cm^{-2})
rGO[6]	361	1.58	~17.5	4.71 (0.05 mA cm^{-2})
LSAC[7]	1649	1.21	~8	1.2 (0.05mA cm^{-2})
CRG[8]	535.3	0.41	~5	0.45 (0.075mA cm^{-2})
Activated tea leaves[9]	2868.4	1.16	<1	1.25 (0.1 mA cm^{-2})

Table S3 Comparison of the cycle life carbon-b with values reported in literature for different Li-O_2 battery cathodes.

Sample	Current density (mA cm^{-2})	Capacity limitation (mA h cm^{-2})	Cycle number
Carbon-b	0.1	0.5	58
C-IL[10]	0.1	0.7	26
graphene aerogel[11]	0.12	0.6	30
CMK-3[5]	0.1	0.5	13
N-doped C[12]	0.08	1.5	20
Fe_2O_3/carbon[13]	0.1	0.48	30
Co@N-C microspheres[14]	0.1	0.5	40
MOF(Fe/Co)-CNTs[15]	0.1	0.6	40
Biphasic N-doped Co@graphene capsule[16]	0.1	1	30
$NiFe_2O_4$/C nanofibers[17]	0.1	0.44	40

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