Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Dense yet highly ion permeable graphene electrodes by capillary-drying of holey graphene oxide assembly

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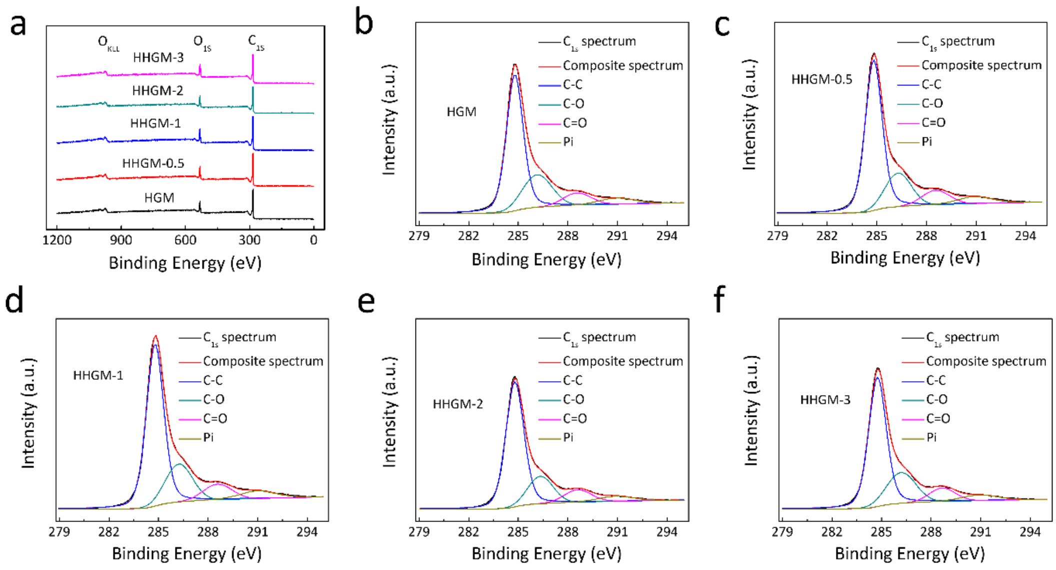

Figure S1 (a) XPS survey spectra of HGM and HHGMs; (b)-(f) C1s spectra of HGM and HHGMs.

Table S1 The ratios of C/O of HGM, HHGM-0.5, HHGM-1, HHGM-2 and HHGM-3

Sample	HGM	HHGM-0.5	HHGM-1	HHGM-2	HHGM-3
C (%)	85.5	84.5	84.5	83	82.1
O (%)	14.5	15.5	15.5	17	17.9
C/O	5.90	5.45	5.45	4.88	4.59

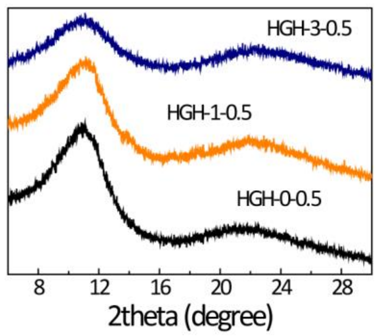

Figure S2 XRD patterns of HGH-0-0.5, HGH-1-0.5 and HGH-3-0.5.

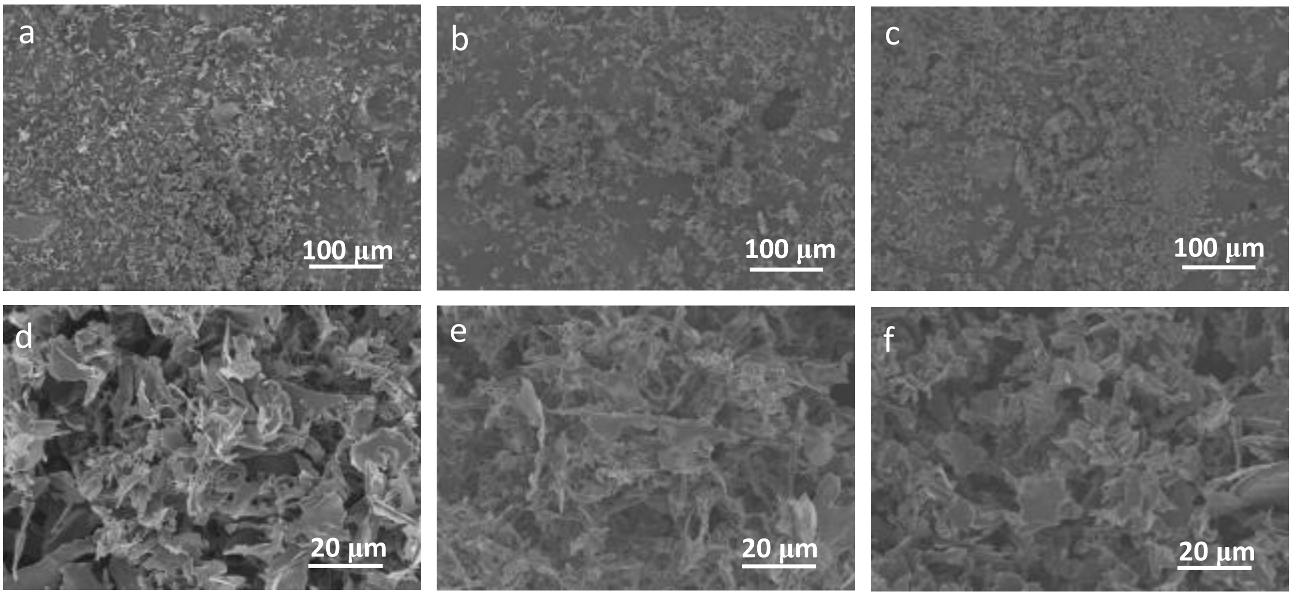

Figure S3 (a) and (d) SEM images of HGH-3-1.5; (b) and (e) SEM images of HGH-3-3; (c) and (f) SEM images of HGH-3-4.5.

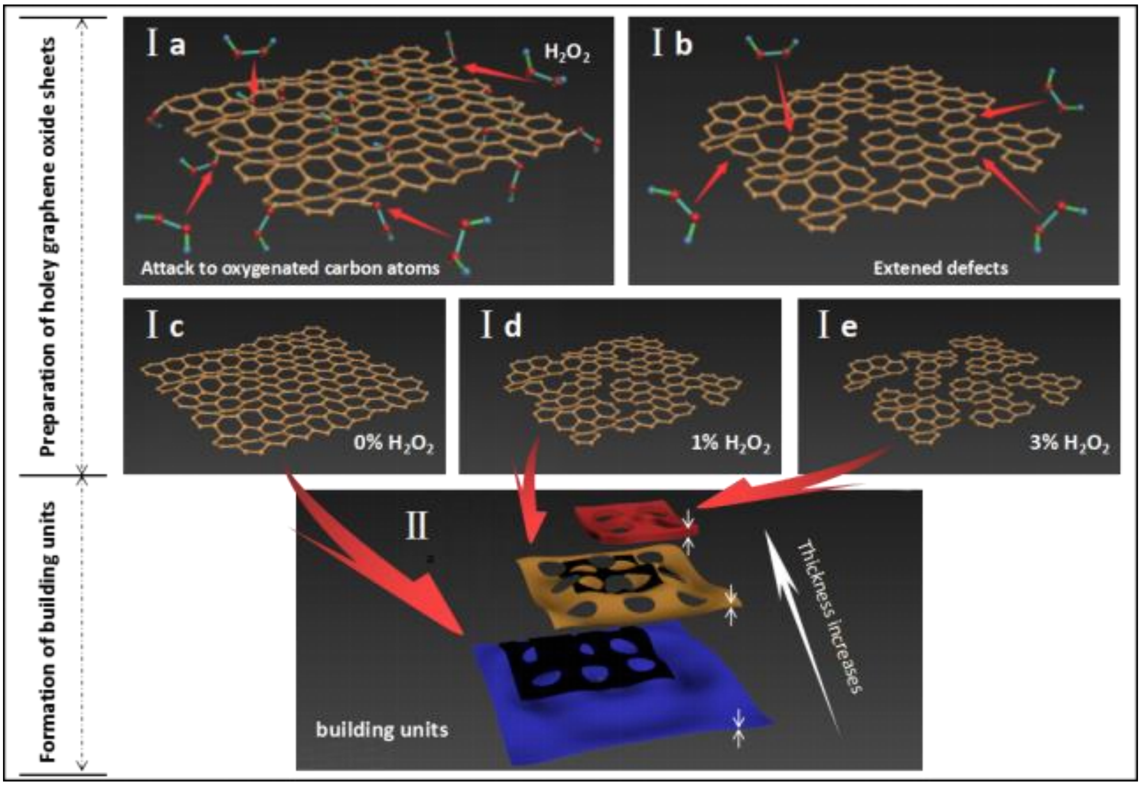

Figure S4 Schematic of H_2O_2 etching. The introduction of hydrogen peroxide can change the size of the GO sheets and promote the formation of "in-plane nanopores" on GO sheets.

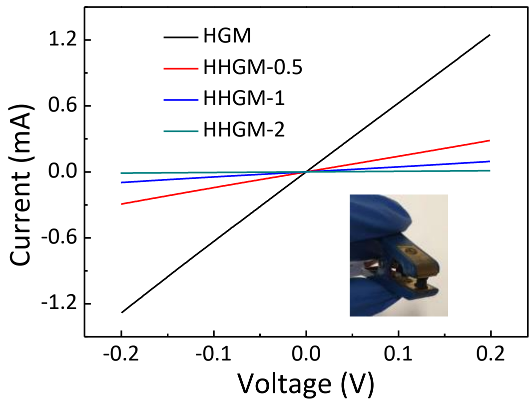

Figure S5 I-V curves of HGM and HHGMs.

Table S2 The conductivities of HGM and HHGMs.

Sample	△I (A)	△U (V)	R (Ω)	1/R (S)	L (m)	1/(RL) (S • m-1)
HGM	2.53E-03	3.99E-01	1.58E+02	6.34E-03	4.35E-03	1.46E+00
HHGM-0.5	5.78E-04	3.99E-01	6.91E+02	1.45E-03	4.06E-03	3.57E-01
HHGM-1	1.92E-04	3.99E-01	2.08E+03	4.80E-04	3.88E-03	1.24E-01
HHGM-2	2.18E-05	4.00E-01	1.84E+04	5.45E-05	2.29E-03	2.38E-02

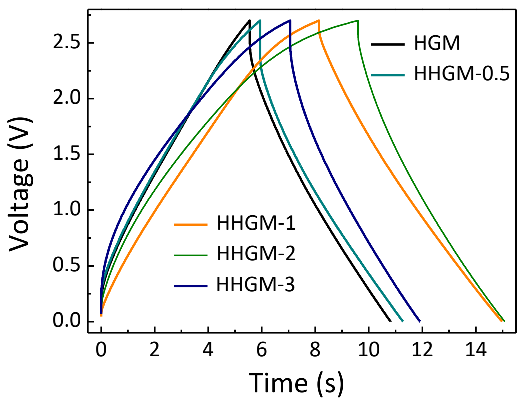

Figure S6 Galvanostatic charge/discharge results of HHGMs at 20 A g^{-1}.

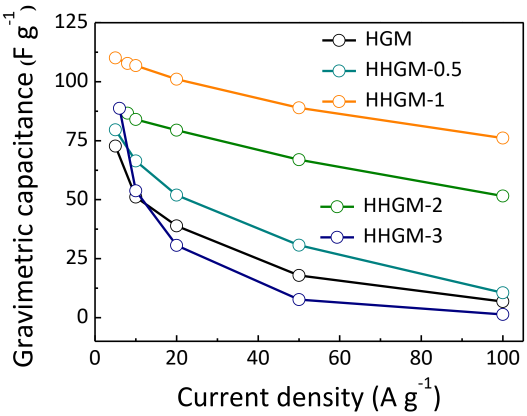

Figure S7 Rate performance of HHGMs in organic electrolyte.

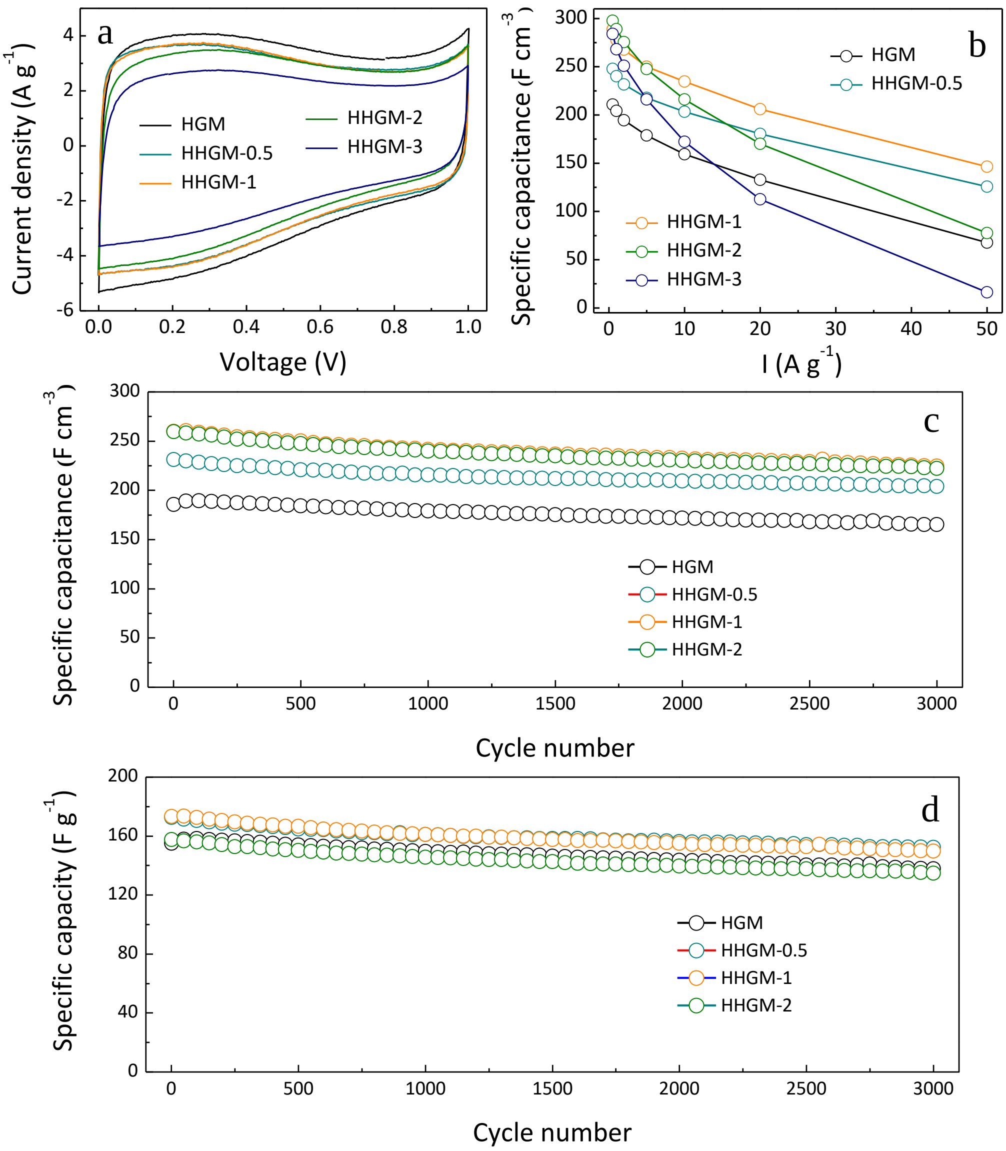

Figure S8 Electrochemical performance of HHGMs in 6M KOH. (a) CV profiles of HHGMs; (b) Rate performance; (c) and (d) cycling performance at 20 A g^{-1}.

Table S3 Performance comparison of HHGM-1 with various carbon materials in organic electrolytes

Sample	Density (g cm^{-3})	Potential	CV [F cm^{-3}]	E/P	Ev/Pv	Ref
HHGM-1	1.504	2.7 V	165 (5 A g^{-1})	-	-	This work
Compressed-25	0.75	2.7 V	98 (1 A g^{-1})	33/-	25/	1
Compressed-25	0.75	3.5 V	110 (1.24 A g^{-1})	-	-	1
LN900t	0.8	2.3 V	75 (0.2 A g^{-1})	17.5/-	14.0/-	2
SWNT solid	0.55	2.5 V	44	-	-	3
ZTC-S	-	2.5 V	75-83 (20 A g^{-1})	-	-	4
aerosol-carbon	0.75	2.7 V	86 (0.1 A g^{-1})	30/270	22.5/202.5	5
r[GO-CNT]	1.5	3 V	165 (0.5 A g^{-1})	-	-	6
Holey graphene film	-	-	54 (3 A g^{-1})	-	-	7
A-aMEGO	1.15	3.5 V	158 (1 A g^{-1})	-	-	8
aMEGO	0.34	-	56 (1 A g^{-1})	-	-	9
N-CS-600	0.97	2.5 V	92 (40 A g^{-1})	-	-	10

Table S4 Time constants (t_0) of HHGMs

Sample	HGM	HHGM-0.5	HHGM-1	HHGM-2	HHGM-3
Log (freq/Hz)	-0.261	-0.265	0.284	0.074	-0.389
f_0 (Hz)	0.548	0.543	1.924	1.185	0.409
t_0 (s)	1.824	1.842	0.520	0.844	2.447

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