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Supporting Information

Hierarchically porous graphene/wood-derived carbon activated using $ZnCl_2$ and decorated with in situ grown $NiCo_2O_4$ for high–performance asymmetric supercapacitors

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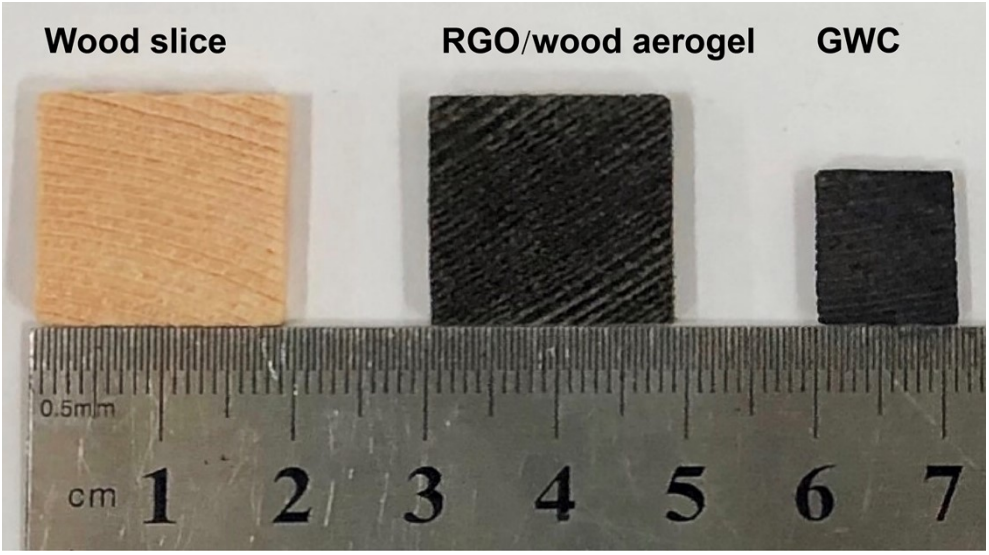

Fig. S1. Digital images of wood slice, RGO/wood aerogel, and GWC.

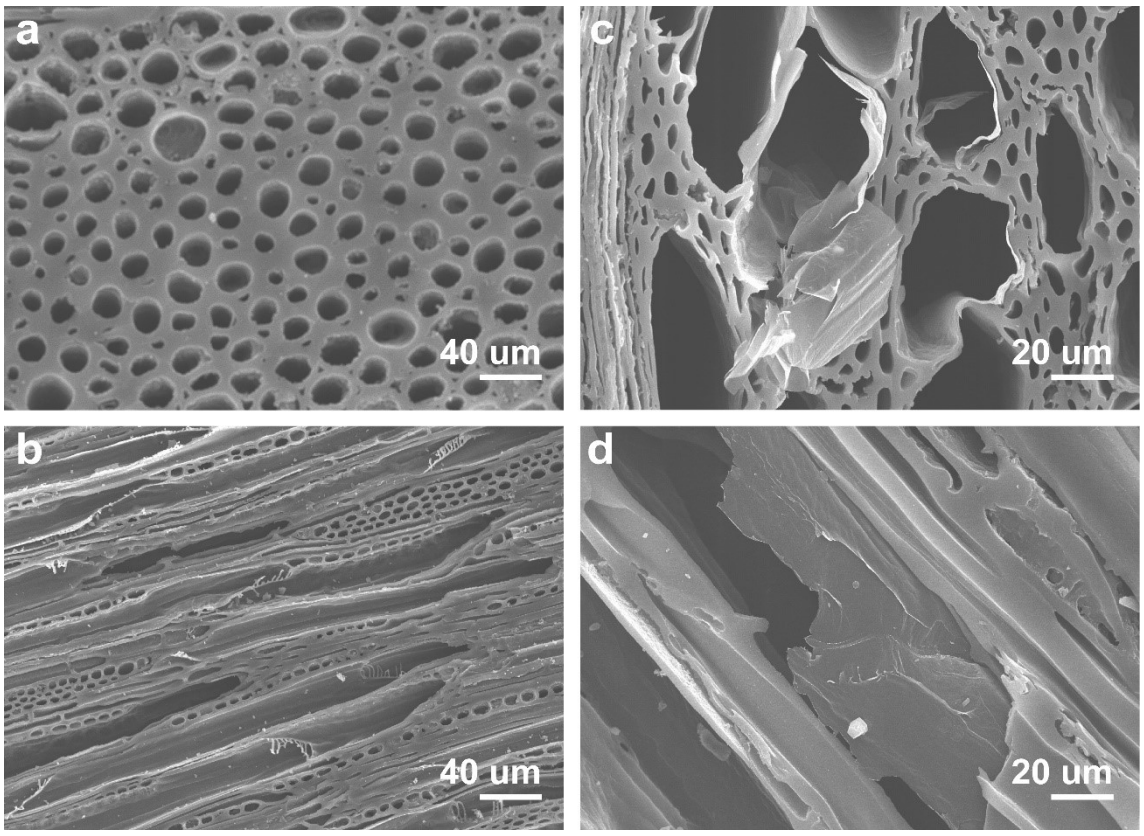

Fig. S2. (a) Top-view and (b) side-view SEM images of hardwood carbon. (c) Top-view and (d) side-view SEM images of hardwood carbon filled with RGO.

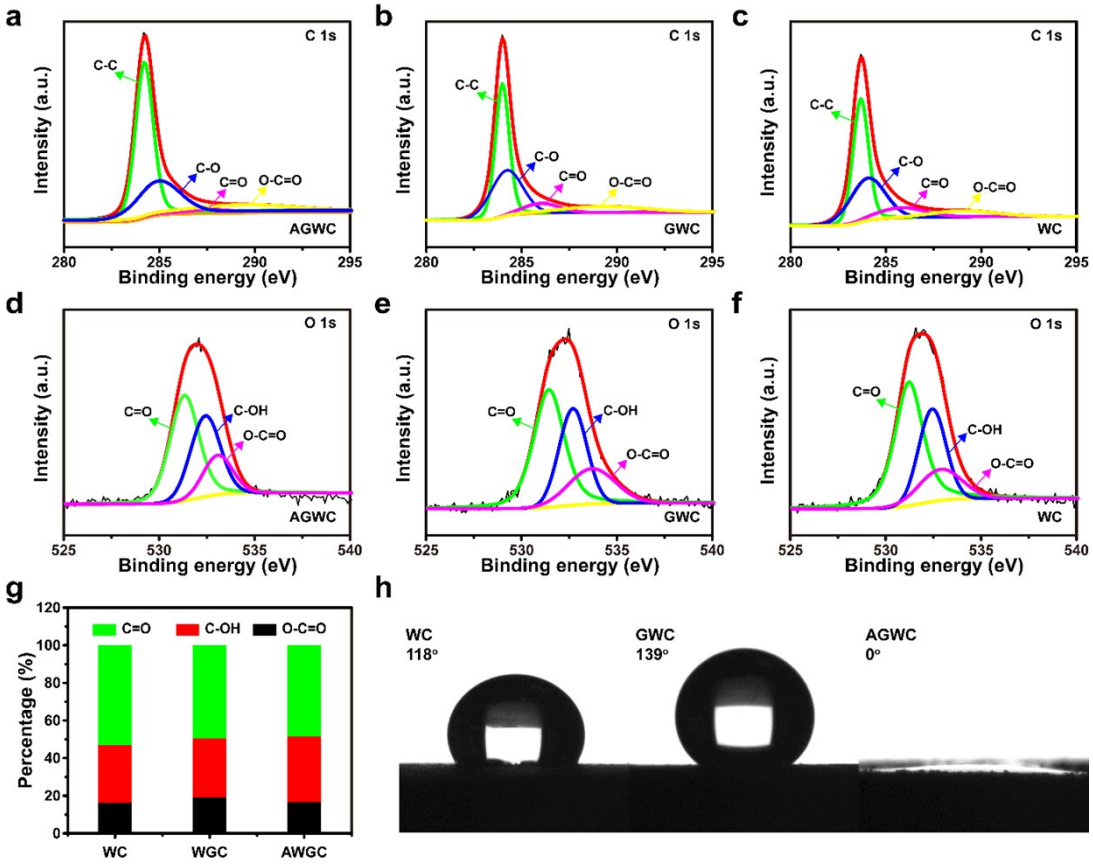

Fig. S3. (a) XPS C 1s and (d) O 1s spectra of AGWC. (b) XPS C 1s and (e) O 1s spectra of GWC. (c) XPS C 1s and (f) O 1s spectra of WC. (g) Percentages of oxygen-containing species, and (h) contact angles of water on WC, GWC, and AGWC.

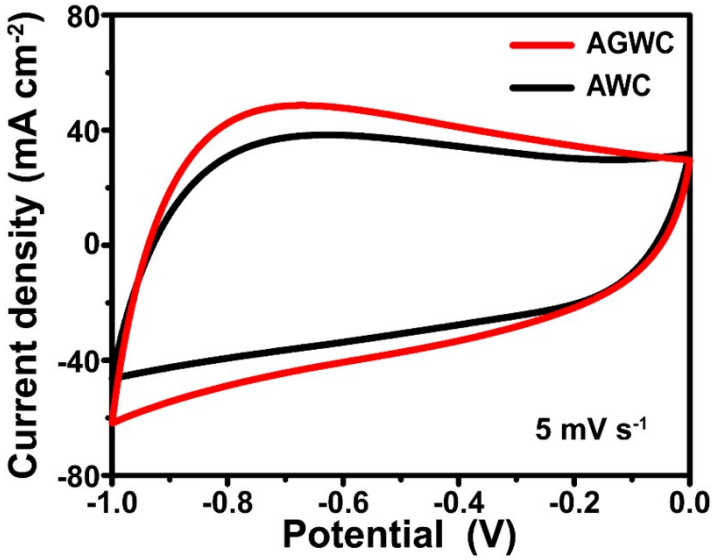

Fig. S4. CV curves of AWC and AGWC electrodes in the range of -1 – 0 V at 5 mV s^{-1}.

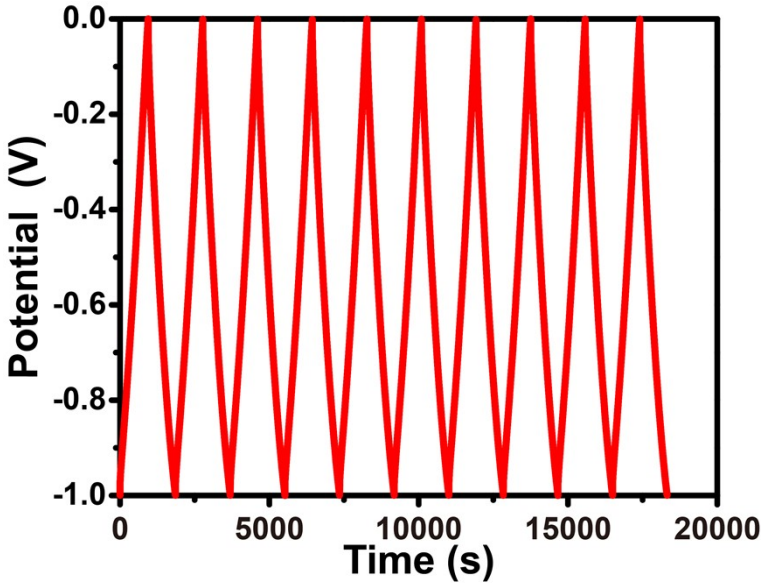

Fig. S5. Charge-discharge profile of the AGWC electrode for 10 cycles at 10 mA cm^{-2}.

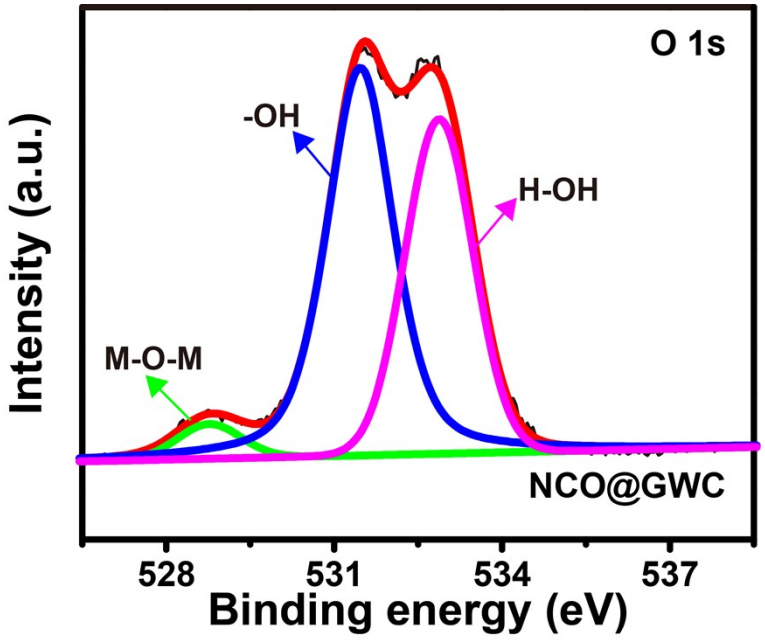

Fig. S6. XPS O 1s spectrum of the NCO@GWC.

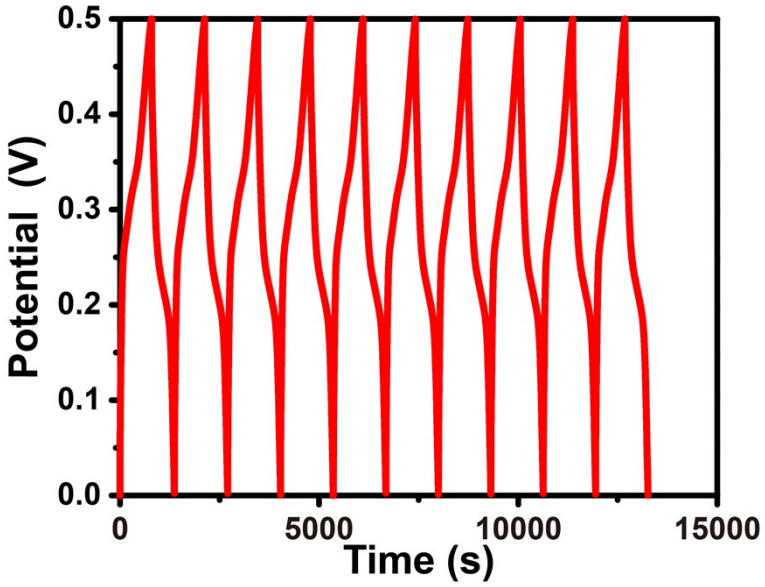

Fig. S7. Charge-discharge profile of the NCO@GWC electrode for 10 cycles at 10 mA cm^{-2}.

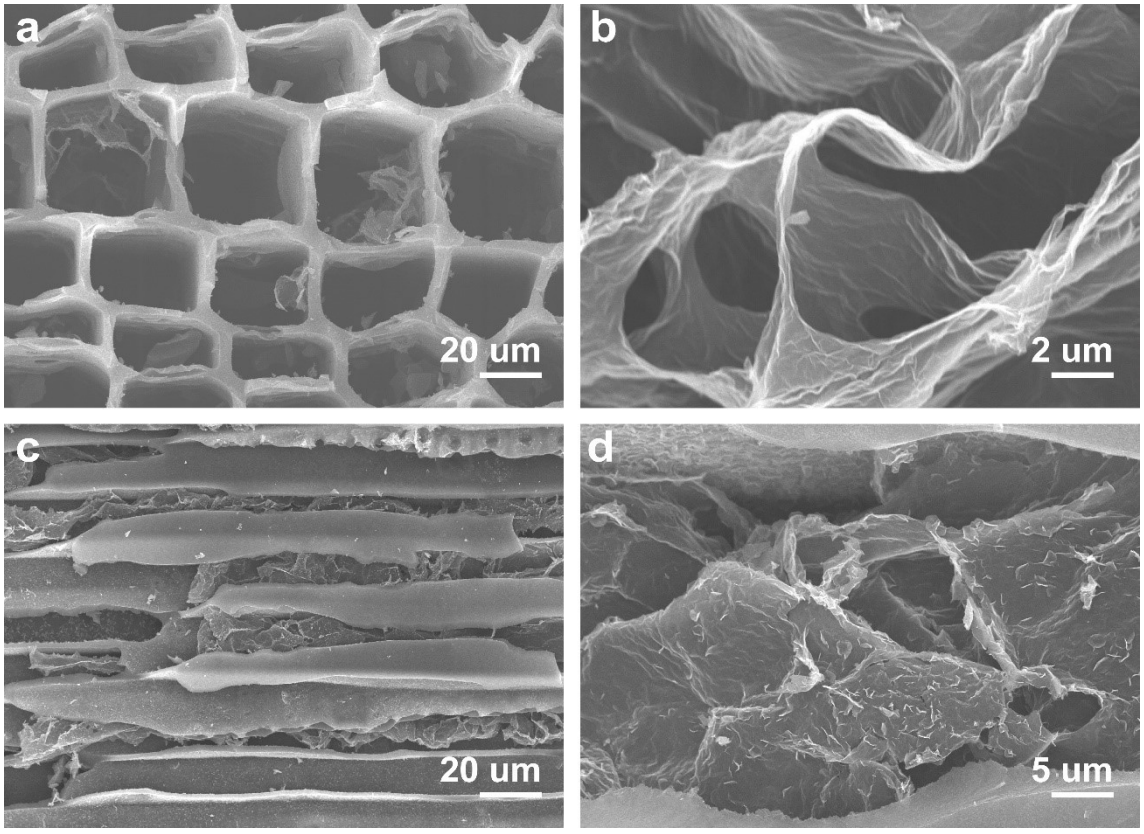

Fig. S8. SEM images of the as-assembled (a, b) AGWC and (c, d) NCO@GWC electrodes after cycling.

Table S1. Sizes and densities of wood, WC, and GWC.

Samples	Size (mm^3)	Density ($g\ cm^{-3}$)
Wood	20 × 20 × 3	0.37
WC	12 × 15 × 2	0.30
GWC	12 × 15 × 2	0.32

Table S2. Comparison of capacitances of AGWC with those of other GO-based electrodes.

Electrodes	Electrolytes	Performances	Ref.
Graphene ribbon films	6 M KOH	6700 mF cm^{-2} at 5 mA cm^{-2} 318 F g^{-1} at 5 mA cm^{-2}	[56]
Hydroxyl-rich graphene hydrogels	1 M H_2SO_4	2675 mF cm^{-2} at 1 mA cm^{-2} 260 F g^{-1} at 1 A g^{-1}	[57]
Chlorine-doped graphene films	6 M KOH	2312 mF cm^{-2} at 1 mA cm^{-2} 210 F g^{-1} at 1 A g^{-1}	[58]
AGWC-1	6 M KOH	9462 mF cm^{-2} at 1 mA cm^{-2} 158 F g^{-1} at 1 mA cm^{-2}	This work
AGWC-2	6 M KOH	10965 mF cm^{-2} at 1 mA cm^{-2} 183 F g^{-1} at 1 mA cm^{-2}	This work
AGWC-3	6 M KOH	10127 mF cm^{-2} at 1 mA cm^{-2} 168 F g^{-1} at 1 mA cm^{-2}	This work

Table S3. Densities and areal mass loadings of different NCO@GWC samples.

Sample	Density ($g\ cm^{-3}$)	Areal mass loading ($mg\ cm^{-2}$)
NCO@GWC-1	0.33	7.5
NCO@GWC-2	0.35	10
NCO@GWC-3	0.36	12.9
NCO@WC	0.33	8.5

Table S4. Comparison of the capacitances of NCO@GWC with those of other $NiCo_2O_4$-based electrodes reported.

Electrodes	Electrolytes	Performances	Ref.
$NiCo_2O_4$@Ni-S	1 M NaOH	1850 mF cm^{-2} at 8 mA cm^{-2} 926 F g^{-1} at 8 mA cm^{-2}	[64]
Oxygen-vacancies-enabled $NiCo_2O_4$	6 M KOH	3800 mF cm^{-2} at 2 mA cm^{-2} 338.5 F g^{-1} at 2 mA cm^{-2}	[65]
$NiCo_2O_4$@RGO	6 M KOH	3600 mF cm^{-2} at 5 mA cm^{-2} 1125 F g^{-1} at 5 mA cm^{-2}	[66]
NCO@GWC-1	6 M KOH	1927 mF cm^{-2} at 1 mA cm^{-2} 257 F g^{-1} at 1 mA cm^{-2}	This work
NCO@GWC-2	6 M KOH	8540 mF cm^{-2} at 1 mA cm^{-2} 854 F g^{-1} at 1 mA cm^{-2}	This work
NCO@GWC-3	6 M KOH	4179 mF cm^{-2} at 1 mA cm^{-2} 324 F g^{-1} at 1 mA cm^{-2}	This work
NCO@WC-2	6 M KOH	3480 mF cm^{-2} at 1 mA cm^{-2} 409 F g^{-1} at 1 mA cm^{-2}	This work

Table S5. Comparison of electrochemical performances of wood-based or carbon-based asymmetric supercapacitors.

Materials		Areal Capacitance	Energy Density	Power Density	Ref.
Cathodes	**Anodes**				
$NiCo_2O_4$@TiN NFs		82 mF cm^{-2}	0.083 mWh cm^{-3}	5.005 mW cm^{-3}	[67]
$NiCo_2O_4$@Ni_3S_2 NWAs 3000 mF cm^{-2}	Activated carbon	1380 mF cm^{-2}	1.89 mWh cm^{-3}	5.81 mW cm^{-3}	[68]
CoP NW	MnO_2 NW		0.69 mWh cm^{-3}	10.15 mW cm^{-3}	[69]
MnO_2@WC 4155 mF cm^{-2}	AWC 3204 mF cm^{-2}	3600 mF cm^{-2}	1.6 mWh cm^{-2}	1.04 mW cm^{-2}	[35]
$Co(OH)_2$@CW 3723cm^{-2}	CW	2200 mF cm^{-2}	4.45 mWh cm^{-3}	7.51 mW cm^{-3}	[36]
WG@$Ni(OH)_2$/$Co(OH)_2$ 5306 mF cm^{-2}	Graphitized wood 3060 mF cm^{-2}	2409 mF cm^{-2}	0.75 mWh cm^{-2}	0.75 mW cm^{-2}	[37]
NCO@GWC 8540 mF cm^{-2}	AGWC 10965 mF cm^{-2}	7116 mF cm^{-2}	4.9 mWh cm^{-3}	11.7 mW cm^{-3}	This work