Electronic Supplementary Information (ESI) for

Crumpled nitrogen-doped graphene-ultrafine Mn_3O_4 nanohybrids and their application in supercapacitors

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Table S1. Electrochemical properties of various Mn_3O_4 and Mn_3O_4 based composite materials explored in aqueous electrolytes.

Material	Electrolyte	Measurement system	C_m (F/g)	Method	Cycle life	Ref.
spinel Mn_3O_4	0.2 M Na_2SO_4	three-electrode	133.1	CV 50 mV /s	1000	1
Mn_3O_4 hollow-tetrakaidecahedrons	2.0 M KCl	three-electrode	148	CV 5 mV /s	400	2
ball-milled graphite/Mn_3O_4	1M Na_2SO_4	two-electrode	62	CD 1 mA /cm^2	8000	3
aMCMB/Mn_3O_4	1.0 M $LiPF_6$	capacitor cells	178	CD 330mA/g	Not eported	4
Mn_3O_4/RGO	0.5 M Na_2SO_4 5 mM $NaHCO_3$	three-electrode	193	CV 25 mV /s	Not eported	5
Graphene/Mn_3O_4	1 M Na_2SO_4	three-electrode	121	CD 0.5 A/g	10000	6
RGO(31.6%)/Mn_3O_4	1 M Na_2SO_4	three-electrode	153	CV 5 mV/s	1000	7
Mn_3O_4/graphene	1 M Na_2SO_4	three-electrode	230	CD 1 A/g	1000	8
CNGMNs	0.5 M Na_2SO_4 5 mM $NaHCO_3$	three-electrode	254.5	CD 1 A/g	2000	This study

CV = cyclic voltammetry; CD = galvanostatic charge-discharge; RGO= reduced graphene oxide.

According to this table, it can be obviously seen that the crumpled nitrogen-doped graphene-ultrafine Mn_3O_4 nanohybrids (CNGMNs) electrode shows the highest specific capacitance under CD measurements.

Table S2. N 1s core level peak analyses of CNGMNs. Each peak corresponds to a specific type of nitrogen: N-1: pyridinic N, N-2: pyrrolic N, and N-3: quaternary N.

N 1s	N-1 [%]	N-2 [%]	N-3 [%]
Binging energy	398.4 eV	400 eV	401.1 eV
Percentage	17.4	70.3	12.3

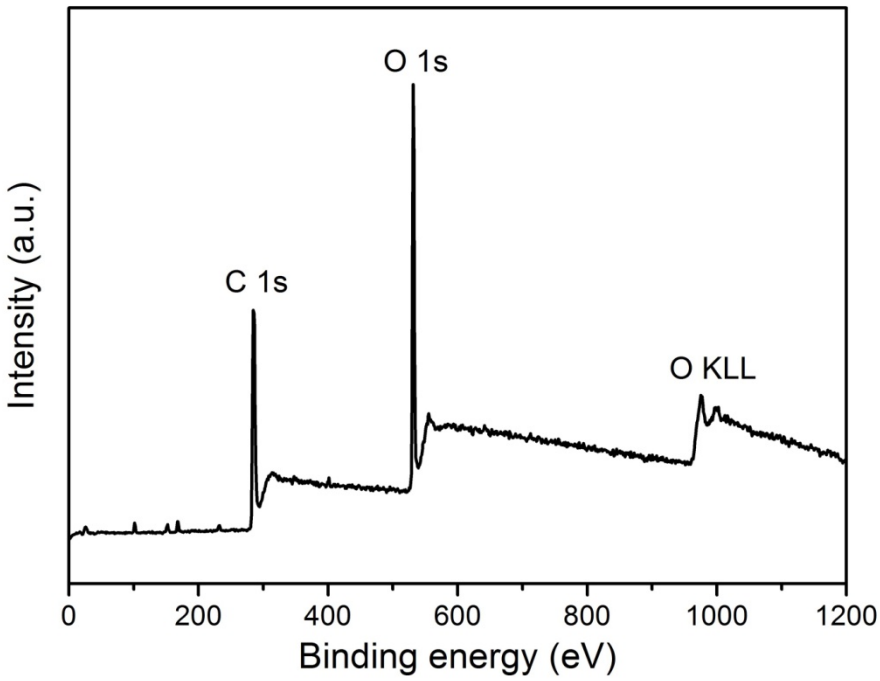


Figure S1. XPS survey spectra of GO prepared from natural flake graphite by a modification of Hummers method.

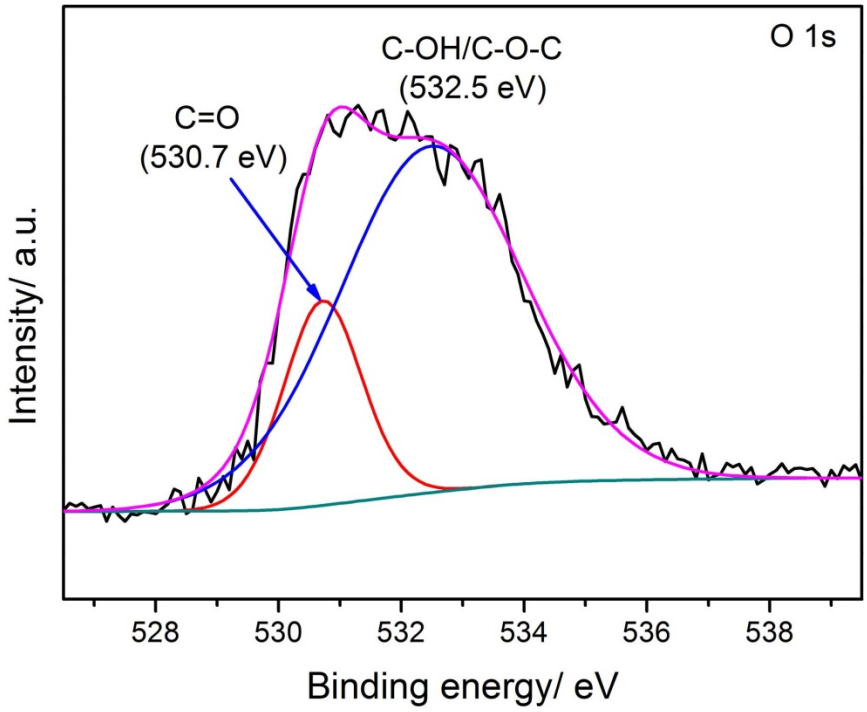
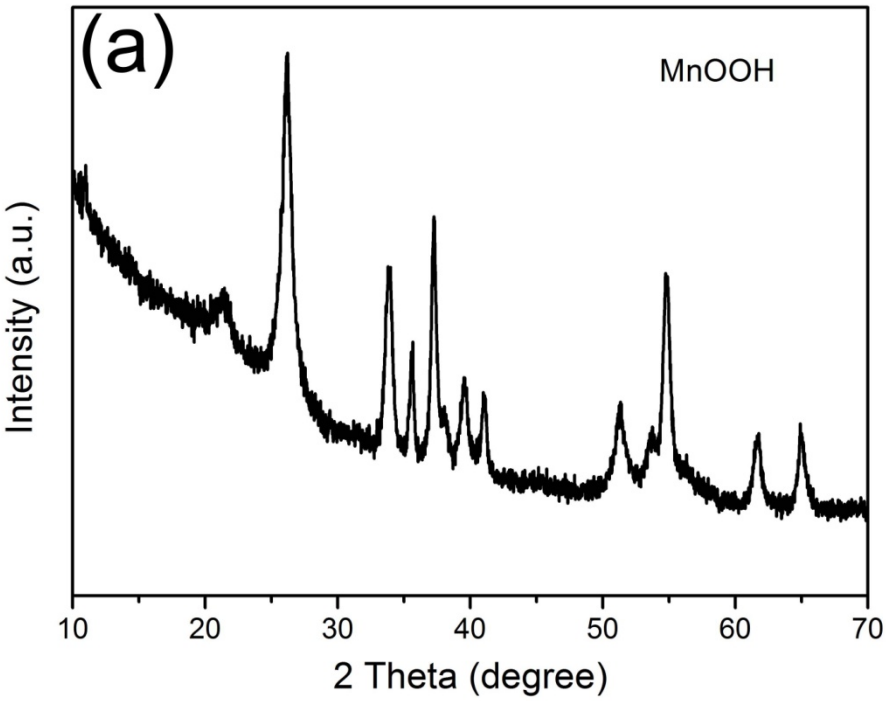


Figure S2. Narrow O 1s XPS spectra of the NG



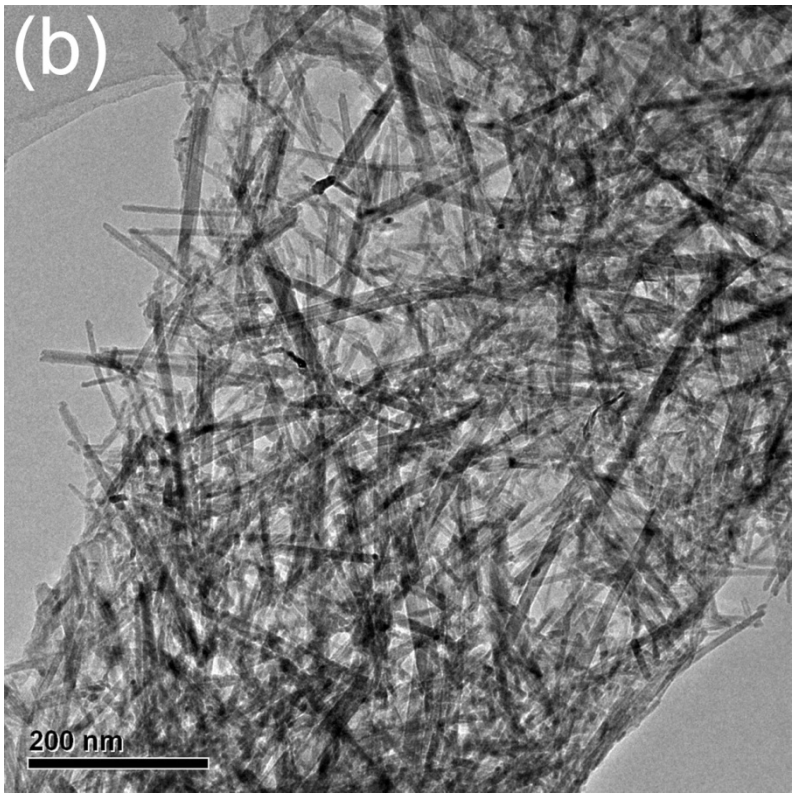


Figure S3. XRD pattern (a) and TEM image (b) of the sample prepared under the same experimental conditions in absence of aniline.

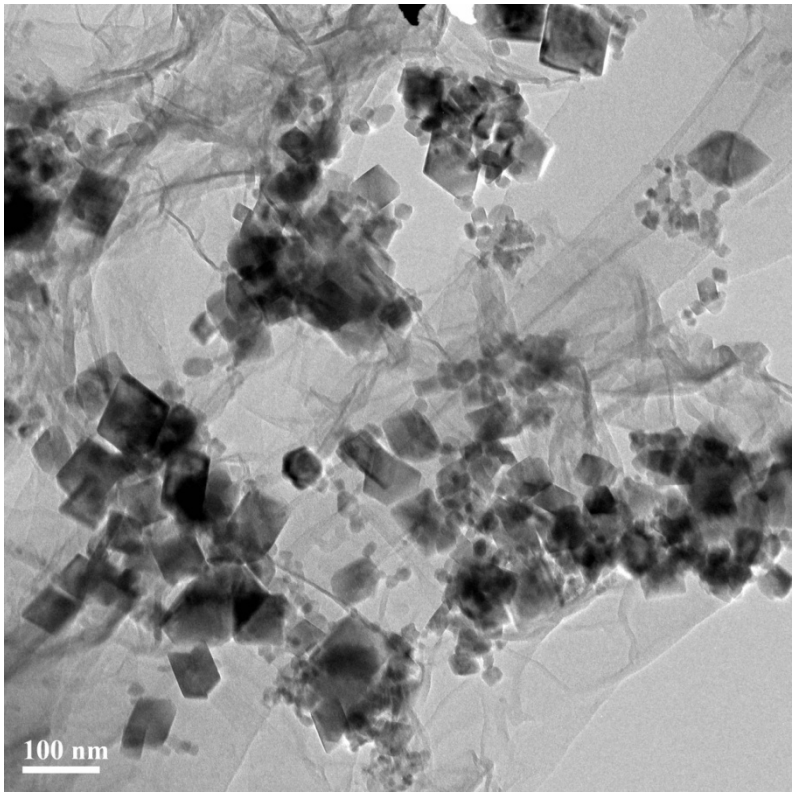


Figure S4. TEM image of the sample prepared under the same experimental conditions except for reaction time (12 h).

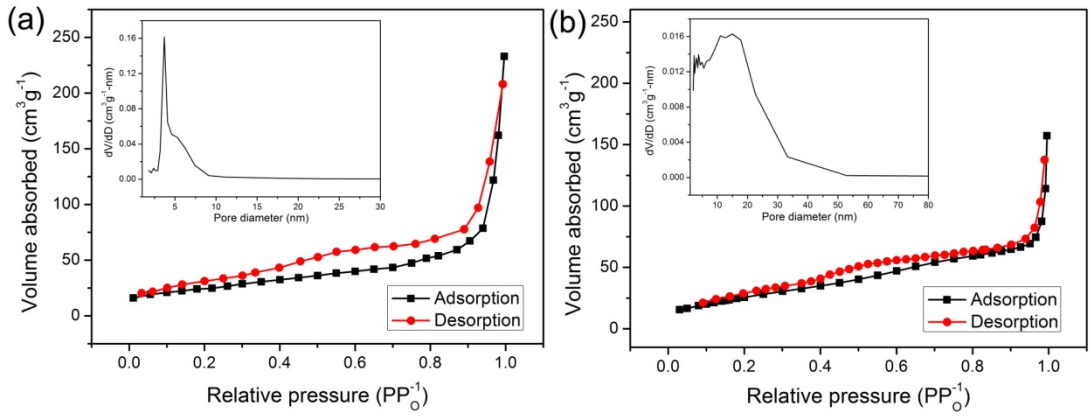


Figure S5. Nitrogen adsorption and desorption isotherm of CNGMNs (a) and rGO-Mn_3O_4 (b). The inset shows corresponding pore size distributions of CNGMNs (a) and rGO-Mn_3O_4 (b).

The specific surface areas of CNGMNs and rGO-Mn_3O_4 are 189.73 $m^2 \cdot g^{-1}$ and 126.54 $m^2 \cdot g^{-1}$, respectively. CNGMNs show a uniform pore size distribution in range of 3-8 nm, whereas rGO-Mn_3O_4 presents irregular pore size distribution from 2 to 50 nm.

References

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