electrochem

Supporting Information
Carbon-α-Fe_2O_3 Composite Active Material for High-Capacity Electrodes with High Mass Loading and Flat Current Collector for Quasi-Symmetric Supercapacitors

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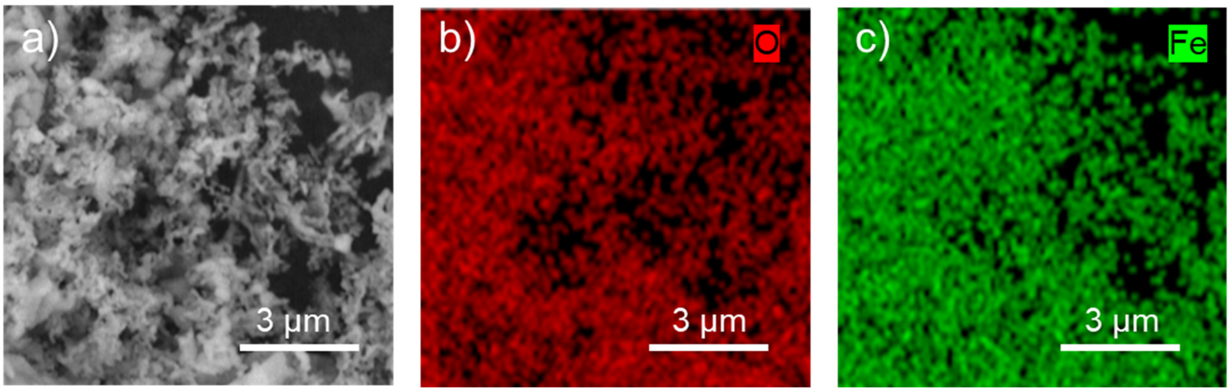

Figure S1. SEM-EDS analysis of C-Fe_2O_3 active material: a) SEM image and the corresponding EDS maps for b) O (K line) and Fe (Kα line).

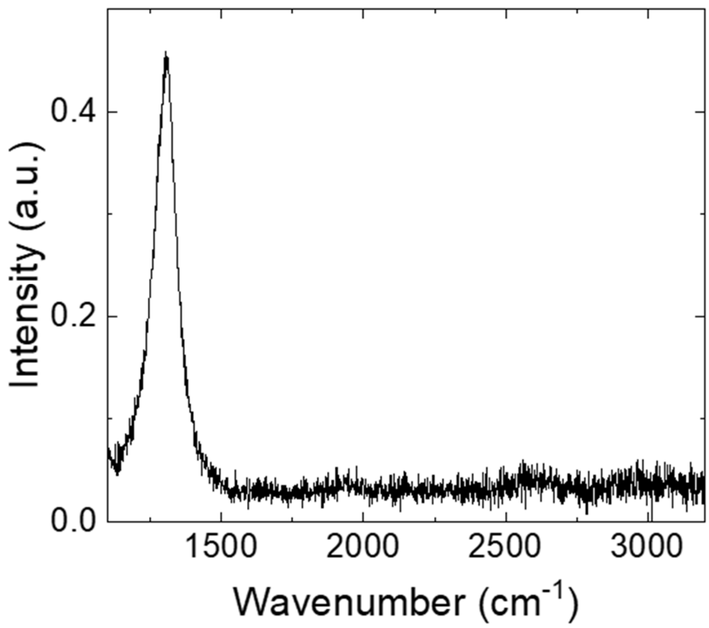

Figure S2. Raman spectrum of C-Fe_2O_3 in the spectral region of G, D and 2D peaks of graphitic species (1100-3200 cm^{-1}).

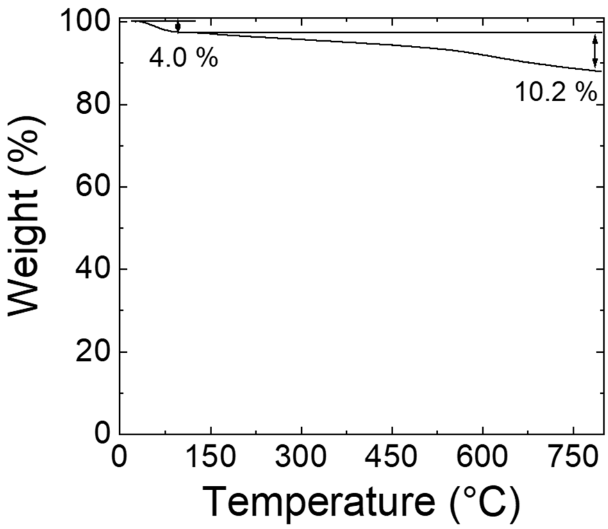

Figure S3. Thermogravimetric analysis (TGA) curve measured for C-Fe_2O_3 in air.

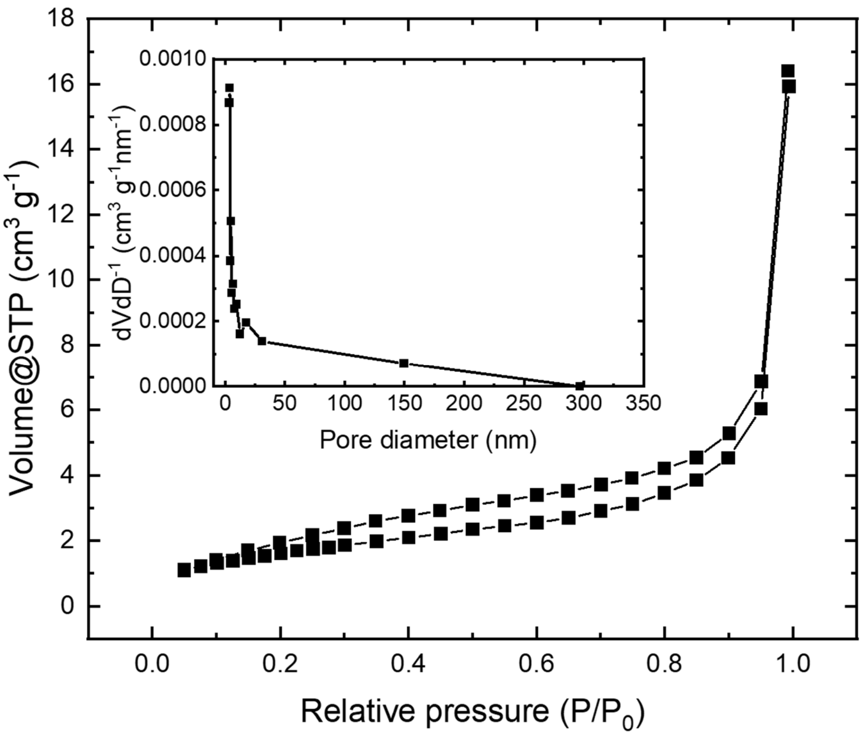

Figure S4. N_2 adsorption-desorption isotherm and the Barret–Joyner–Halenda (BJH) pore size distribution curve (inset) of the C-Fe_2O_3.

Table S1. Comparison between the electrochemical performances of our C-Fe_2O_3 and other Fe_2O_3-based active materials reported in relevant literature. The table is subdivided in different categories (indicated by different colors), depending on the substrate used for the electrochemical characterization of the active material.

Materials	Type of substrate/electrode	Substrate	Synthesis method	Electrolyte	Active material mass loading	Effective capacitance (C_{eff})	Reference
C-Fe_2O_3	Flat	graphite paper	Electrospinning + calcination/carbonization	6 M KOH	> 1 mg cm^{-2}	265.9 F g^{-1} (or 478.6 mF cm^{-2}) at 2 mV s^{-1}	This work
Fe_2O_3 nanotubes on reduced graphene oxide	Flat	Etched-Cu foil	Hydrothermal	1 M Na_2SO_4	1.5-2 mg cm^{-2}	114 F g^{-1} at 5 A g^{-1}	[1]
FeS_2 nanosheet/Fe_2O_3 nanosphere heterostructures	Flat	Ti foil	Hydrothermal	1 M Li_2SO_4	Not given	255 F g^{-1} at 1 A g^{-1}	[2]
Reduced graphene oxide/Fe_2O_3 nanocomposite	Flat	Glassy carbon	Direct one step chemical reduction process	0.5 M H_2SO_4	Not given	50 F g^{-1} at 0.1 V s^{-1}	[3]
Fe_2O_3 quantum dots on functionalized graphene	Flat	Ti foil	Thermal decomposition	1 M Na_2SO_4	2–3 mg cm^{-2}	347 F g^{-1} at 10 mV s^{-1}	[4]
Fe_2O_3 on carbon nanotubes sponge	Free-standing	-	Hydrothermaòl	2 M KCl	Not given	296.3 F g^{-1} at 5 mV s^{-1}	[5]
Fe_2O on graphene foam-carbon nanotube forest	Free-standing	-	Atomic layer deposition	2 M KOH	Not given	470.5 mF cm^{-2} at 20 mA cm^{-2}	[6]
Fe_2O_3 on graphene	Bulky/heavy porous	Ni foam	Hydrothermal combined + slow annealing	1 M Na_2SO_4	7.2 mg cm^{-2}	306.9 F g^{-1} at 3 A g^{-1}	[7]
Graphene aerogel-encapsulated Fe_2O_3	Bulky/heavy porous	Ni foam	Hydrothermal	0.5 M Na_2SO_4	Not given	81.3 F g^{-1} at 1 A g^{-1}	[8]

Graphene/Fe_2O_3 composite hydrogel	Bulky/heavy porous	Ni foam	Hydrothermal	1 M KOH	1 mg cm^{-2}	908 F g^{-1} at 2 A g^{-1}	[9]
Graphene/Fe_2O_3/polyaniline	Bulky/heavy porous	Ni foam	Two step synthesis	6 M KOH	Not given	638 F g^{-1} at 1 mV s^{-1}	[10]
PEDOT-coated Ti-doped Fe_2O_3	Bulky porous	Carbon cloth	Two-step process (hydrothermal + in-situ oxidative polymerization)	5 M LiCl	3.7 mg cm^{-2}	311.6 F g^{-1} at 1 mA cm^{-2}	[11]
Polyaniline/Fe_2O_3-decorated graphene (PGF) composite hydrogel	Bulky porous	Carbon cloth	Chemical synthesis	1 M H_2SO_4	Not given	1124 F g^{-1} at 0.25 A g^{-1}	[12]
Polypyrrole-encapsulated Fe_2O_3 nanotube arrays	Bulky porous	Carbon cloth	Sacrificial template + electrodeposition methods	1 M Na_2SO_4	1.24 mg cm^{-2}	237 mF cm^{-2} at 1 mA cm^{-2}	[13]

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