

Supporting Information for

**Oxygen functional groups improve the energy storage performances
of graphene electrochemical supercapacitors**

Hailiang Cao,^{*,a,b} Xing Peng,^a Min Zhao,^a Peizhi Liu,^a Bingshe Xu^a and Junjie Guo^{*,a}

a Key Laboratory of Interface Science and Engineering in Advanced Materials,
Ministry of Education, Research Center of Advanced Materials Science and
Technology, Taiyuan University of Technology, Taiyuan, 030024, China.

b Key Laboratory of Graphene Technologies and Applications of Zhejiang Province,
Advanced Li-ion Battery Engineering Lab, Ningbo Institute of Materials Technology
and Engineering (NIMTE), Chinese Academy of Sciences, Ningbo 315201, China.

**Corresponding author: E-mail: caohltyut@sohu.com; guojunjie@tyut.edu.cn*

Fax: +86-531-6010-236; Tel: +86-531-6010-236

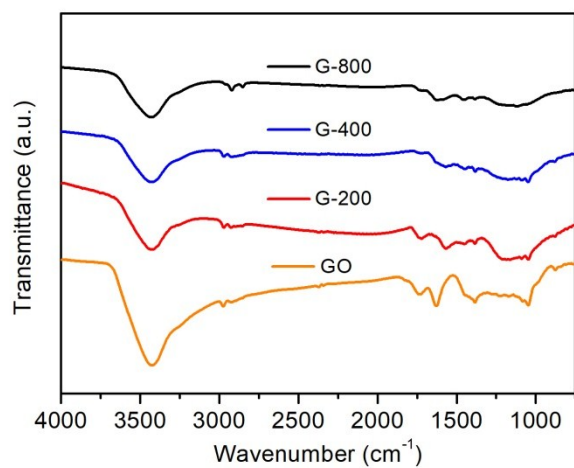


Fig. S1 FTIR transmittance spectra of GO, G-200, G-400 and G-800.

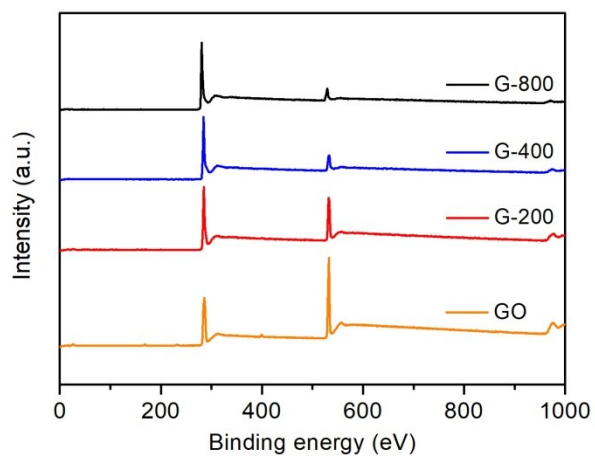


Fig. S2 XPS spectra of GO, G-200, G-400 and G-800.

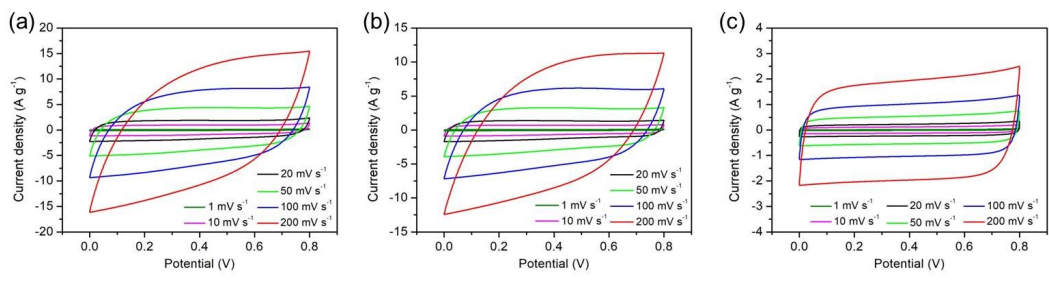


Fig. S3 CV curves of G-200 (a), G-400 (b) and G-800 (c) electrodes at different scan rates within a potential range of 0-0.8 V in 5 M KOH.

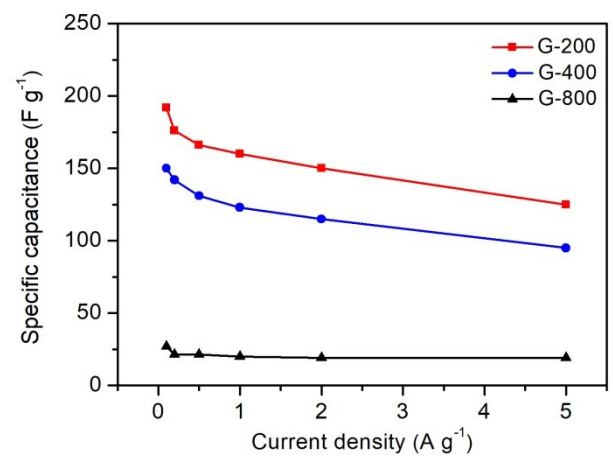


Fig. S4 Specific capacitance of G-200, G-400 and G-800 at different current densities.

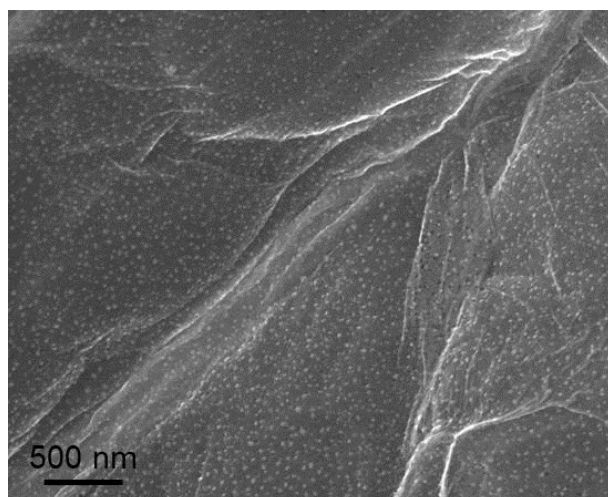


Fig. S5 SEM image of graphene-Co composite after thermal treatment at 800 °C.

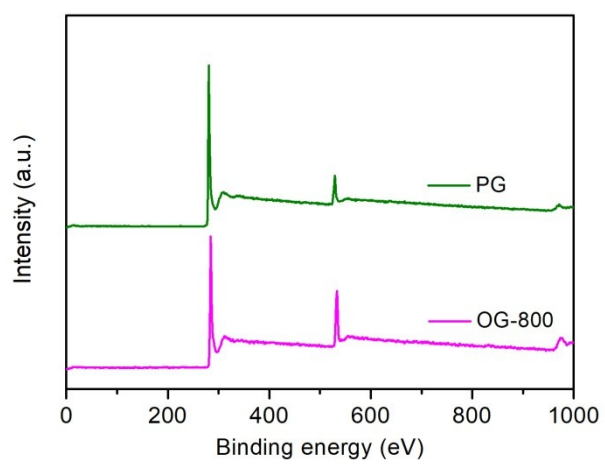


Fig. S6 XPS spectra of PG and OG-800.

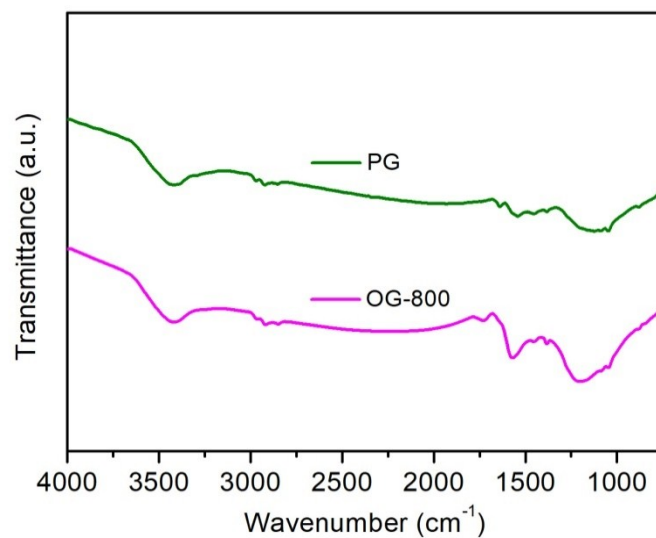


Fig. S7 FTIR transmittance spectra of OG-800 and PG.

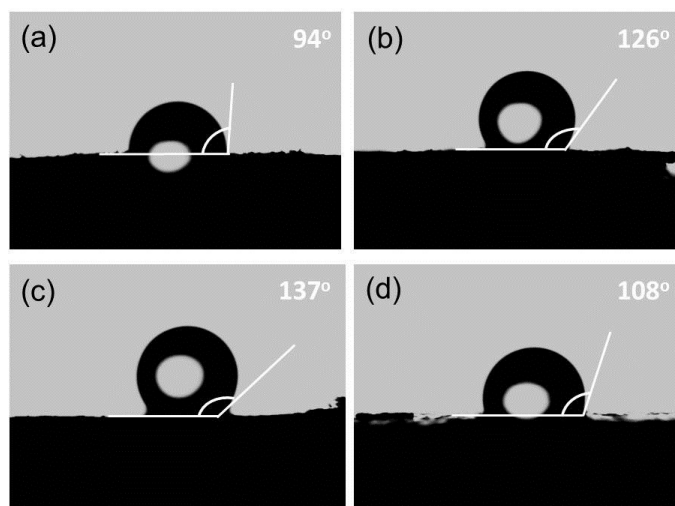


Fig. S8 Contact angle measurements of G-200 (a), G-400 (b), G-800 (c) and OG-800 (d).

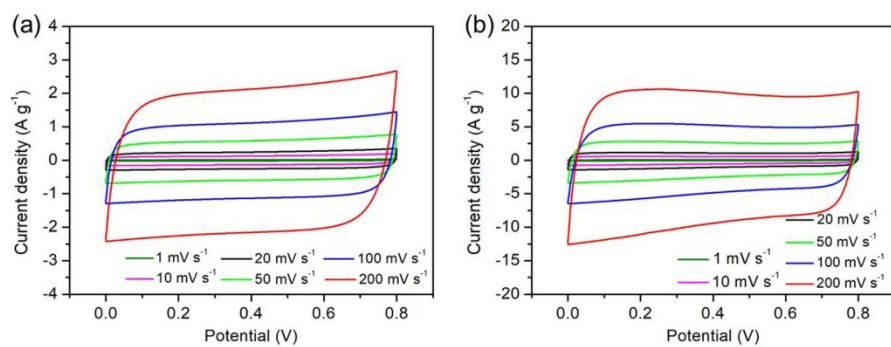


Fig. S9 CV curves of PG (a) and OG-800 (b) electrodes at different scan rates within a potential range of 0-0.8 V in 5 M KOH.

Table S1. Specific surface area, I_D/I_G , XPS elemental analysis (at. %), XPS data of C1s peaks: binding energies and relative area percentages (in parentheses) and specific capacitance of samples.

Sample	G-200	G-400	G-800	PG	OG-800
BET surface area (m ² g ⁻¹)	248	302	251	116	240
I_D/I_G	0.96	0.94	0.93	1.04	0.92
C	80.4	89.3	93.1	93.4	86.6
O	19.6	10.7	6.9	6.6	13.4
C/O	4.1	8.3	13.5	14.2	6.5
C-C	284.6 (56.55)	284.6 (59.80)	284.6 (63.15)	284.6 (63.23)	284.6 (60.03)
C-OH	285.8 (16.63)	285.6 (17.89)	285.7 (15.82)	285.8 (15.20)	285.5 (13.17)
C=O	287.0 (10.9)	286.9 (9.40)	286.8 (10.02)	286.9 (8.45)	286.8 (11.62)
COOH	289.0 (15.91)	289.5 (12.91)	290.0 (11.01)	289.8 (13.12)	289.0 (15.18)
Capacity (F g ⁻¹)					
20 mV s ⁻¹	174	127	23	27	107