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Supplementary information

Inhibiting the growth of lithium dendrites at high current densities with oriented graphene foams

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As shown in Fig. S1, the intensity ratio of the Raman D- (≈1340 cm^{-1}) and G-bands (≈1585 cm^{-1}) was increased from 0.98 for GO to 1.28 for OGF. XPS analysis showed that the C/O atomic ratio increased from 2.50 for GO to 5.18 for OGF. These results demonstrate that the oxygen-containing groups of GO were mostly eliminated by hydrothermal reduction.

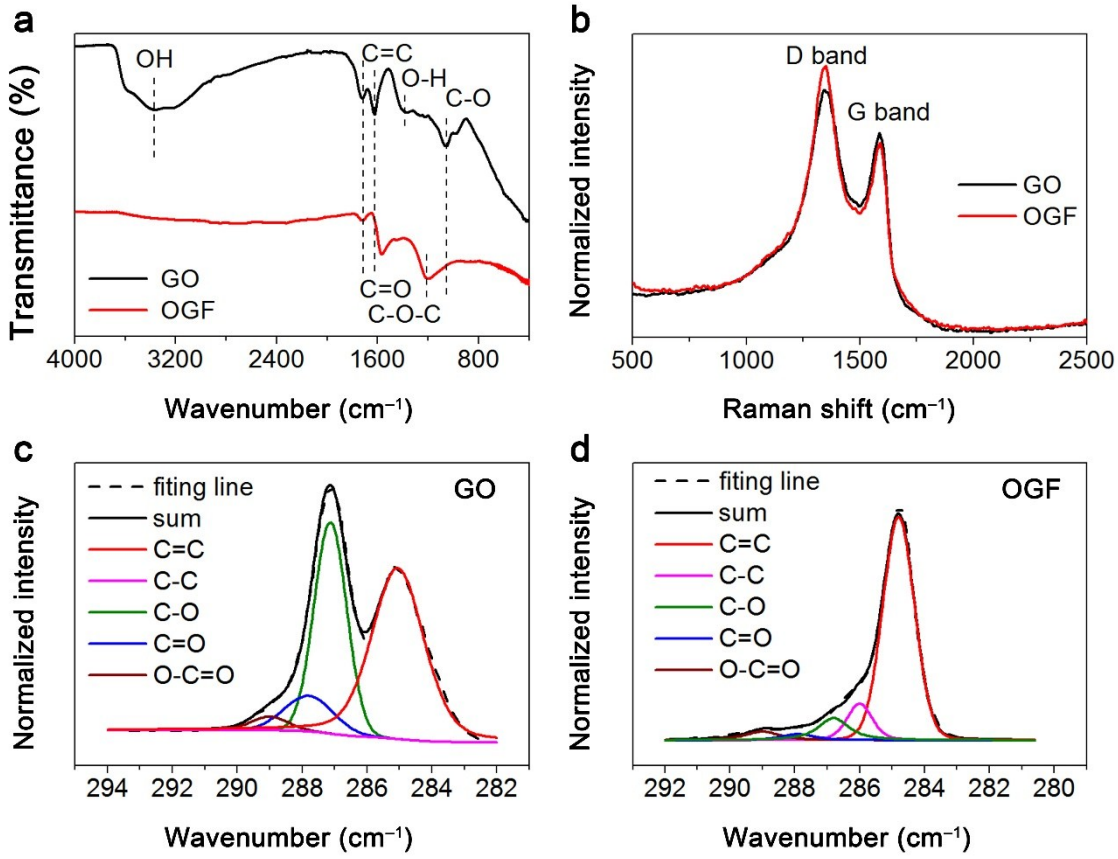

Fig. S1 a) IR and b) Raman spectra of GO and OGF. c, d) C 1s XPS spectra of c) GO and d) OGF.

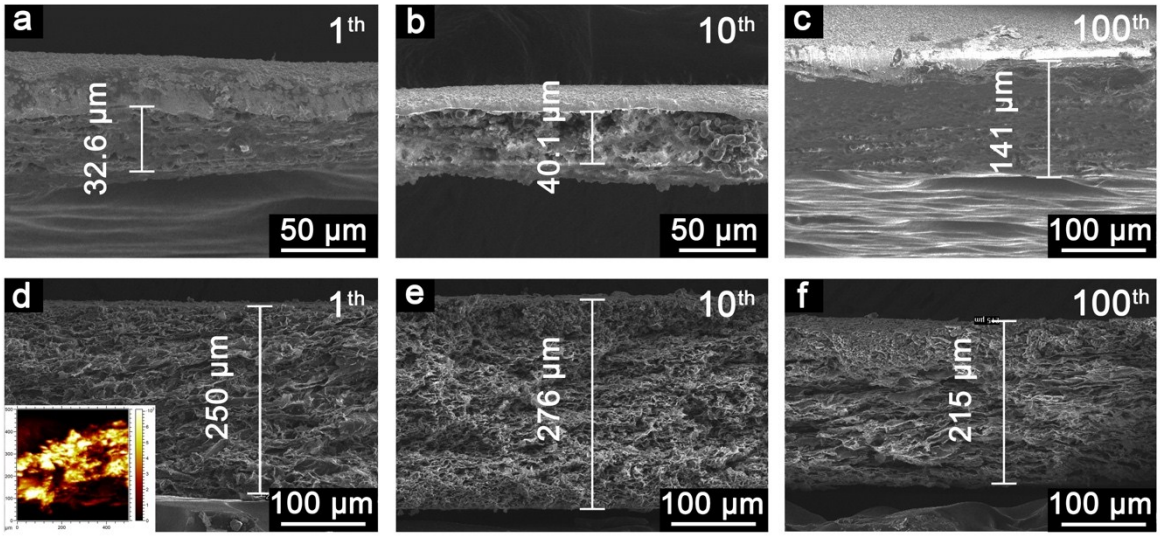

Fig. S2 Cross-sectional SEM images of Li deposited on a-c) Cu foil or d-f) OGF current collector at a current density of 1 mA cm^{-2} for a total capacity of 1 mA h cm^{-2} and different charge/discharge cycles. Inset TOF-SIMS image in (d) shows the distribution of Li in the cross section of OGF current collector.

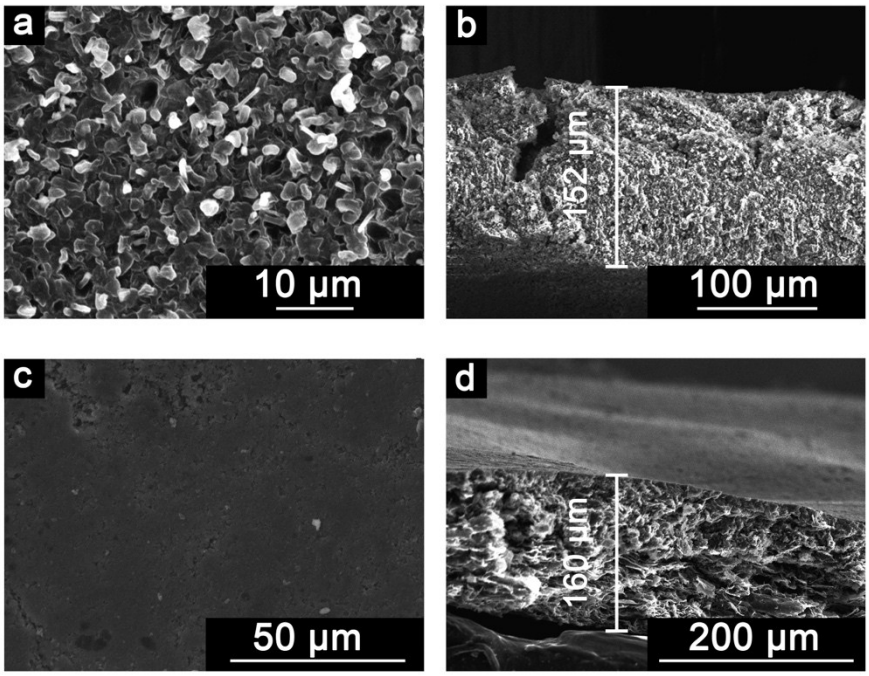

Fig. S3 a, c) Surface and b, d) cross-sectional SEM images of Li deposited on a, b) Cu foil or c, d) OGF current collector after galvanostatic cycling at a current density of 1 mA cm^{-2} for a total capacity of 1 mA h cm^{-2}.

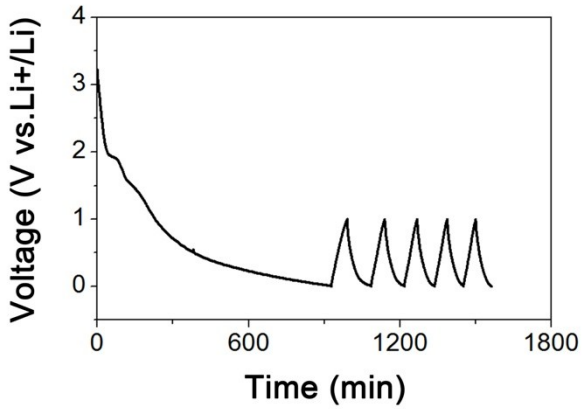

Fig. S4 Typical voltage profile during initialization process. The cells were first cycled from 0 to 1 V at 50 μA for five cycles to stabilize the surfaces of electrodes.

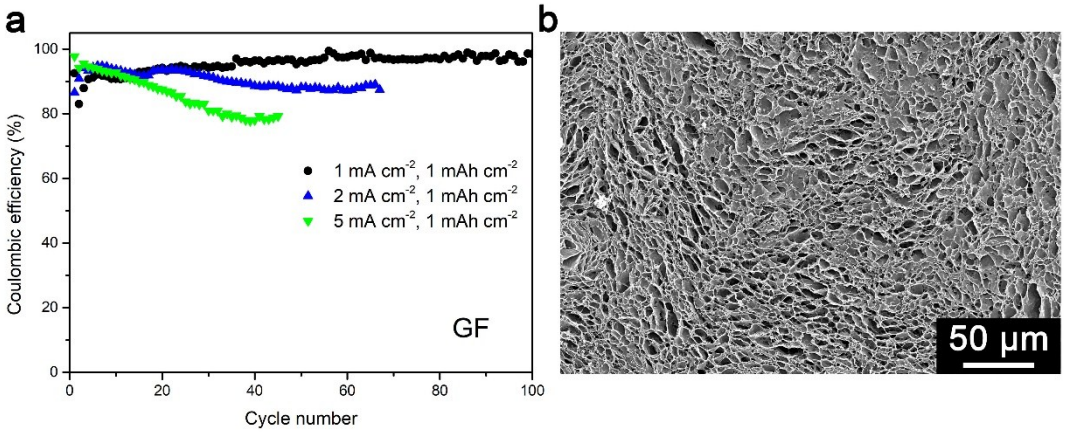

Fig. S5 (a) CEs of Li-GF electrode at 1, 2, and 5 mA cm^{-2}. (b) Cross-section SEM image of GF.

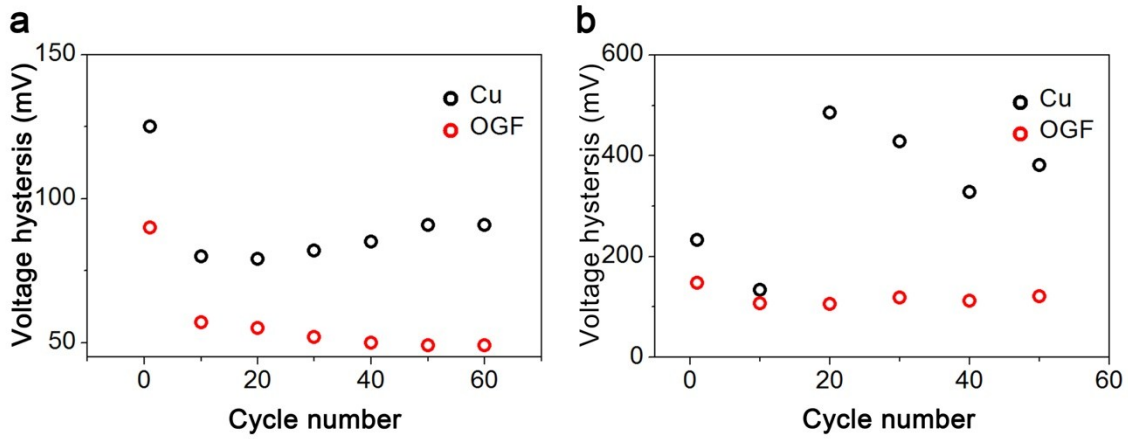

Fig. S6 Voltage hysteresis of Li-Cu or and Li-OGF electrode with a total capacity of 1 mA h cm^{-2} at a current density of a) 2 or b) 5 mA cm^{-2}.

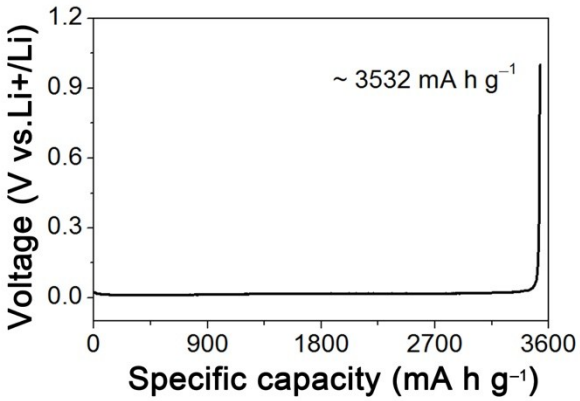

Fig. S7 Full Li stripping curve of the Li-OGF (5 wt%) electrode to 1 V, which shows a specific capacity of ~3532 mA h g^{-1}.

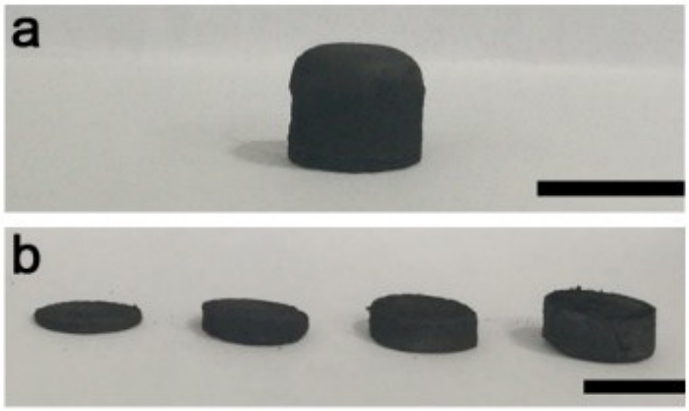

Fig. S8 (a) The photos of lyophilized OGF; (b) The photos of OGF current collectors with various thickness after laser cutting. Scale bars =1 cm.

Table S1. Summary of the electrochemical performance of different current collectors.

	nucleation overpotential (mV) (1 C)	nucleation overpotential (mV) (2 C)	nucleation overpotential (mV) (5 C)	CE (1 C, 100th)	CE (2 C, 60th)	CE (5 C, 40th)
Cu	71	85	142	96.9%	84.0%	69.1%
GF				98.5%	87.1%	78.1%
OGF	41	56	92	98.4%	97.2%	93.2%

	voltage hysteresis (1 C)	voltage hysteresis (2 C)	voltage hysteresis (5 C)	interfacial resistance (Ω) (50 th)
Cu	80	100	400	160
GF				
OGF	40	60	130	23