Electronic supplementary information

Mesoporous Tungsten Carbide Nanostructure as a Promising Cathode Catalyst Decreases Overpotential in Li-O_2 Battery

Tab. S1 Overpotential comparisons of different electrocatalysts in cathode at first cycle.[a]

Cathode	Electrocatalyst	Current density	Overpotential at first cycle	Ref
Cr_2O_3-MNT/Super P/PVDF	Cr_2O_3-MNT	100 mA g^{-1}	1.09 V	1
Co_4N/CNF	Co_4N	200 mA g^{-1}	~1.23 V (at 700 mAh g^{-1})	2
C-Co_3O_4 IO/KB/PVDF	C-Co_3O_4 IO	100 mA g^{-1}	1.21 V	3
Co_3O_4 IO/KB/PVDF	Co_3O_4 IO	100 mA g^{-1}	1.13 V	3
MnCo-MOF-74/KB/PVDF	MnCo-MOF-74	200 mA g^{-1}	1.26 V	4
nitrogen-doped $LaNiO_3$ /Vulcan XC-72/PVDF	nitrogen-doped $LaNiO_3$	250 mA g_{cat}^{-1}	1.24 V	5
$LaCo_{0.8}Fe_{0.2}O_3$@rGO /KB/PVDF	$LaCo_{0.8}Fe_{0.2}O_3$@rGO	200 mA g^{-1}	0.98 V	6
MoC1−x/HSC/PVDF	MoC1−x/HSC	100 mA g^{-1}	0.58 V	7
Ru/r-hGO mesh	Ru	0.1 A cm^{-2}	~0.9 V	8
Mo_2C-NR@11NC	Mo_2C-NR@11NC	100 mA g^{-1}	0.28 V	9
Mo_2C-NR@5NC	Mo_2C-NR@5NC	100 mA g^{-1}	0.45 V	9
Mo_2C-NR@16NC	Mo_2C-NR@16NC	100 mA g^{-1}	0.52 V	9
WC-1/Super P/PTFE	WC-1	100 mA g^{-1} (0.06 mA cm^{-2})	0.93 V	This work
WC-1/Super P/PTFE	WC-1	100 mA g^{-1} (0.06 mA cm^{-2})	0.34 V (with LiI)	This work

a Overpotential is denoted as the potential difference at half-capacity.

The overpotentials of Li-O_2 cells with different electrocatalysts have been compared. The results are listed in **Tab. S1**. According to the data, the catalyst M-WC-1 used in our research displays good proeprty in reducing the overpotentials when comparing with the state-of-the-art electrocatalysts used in Li-O_2 cells in recent reports.

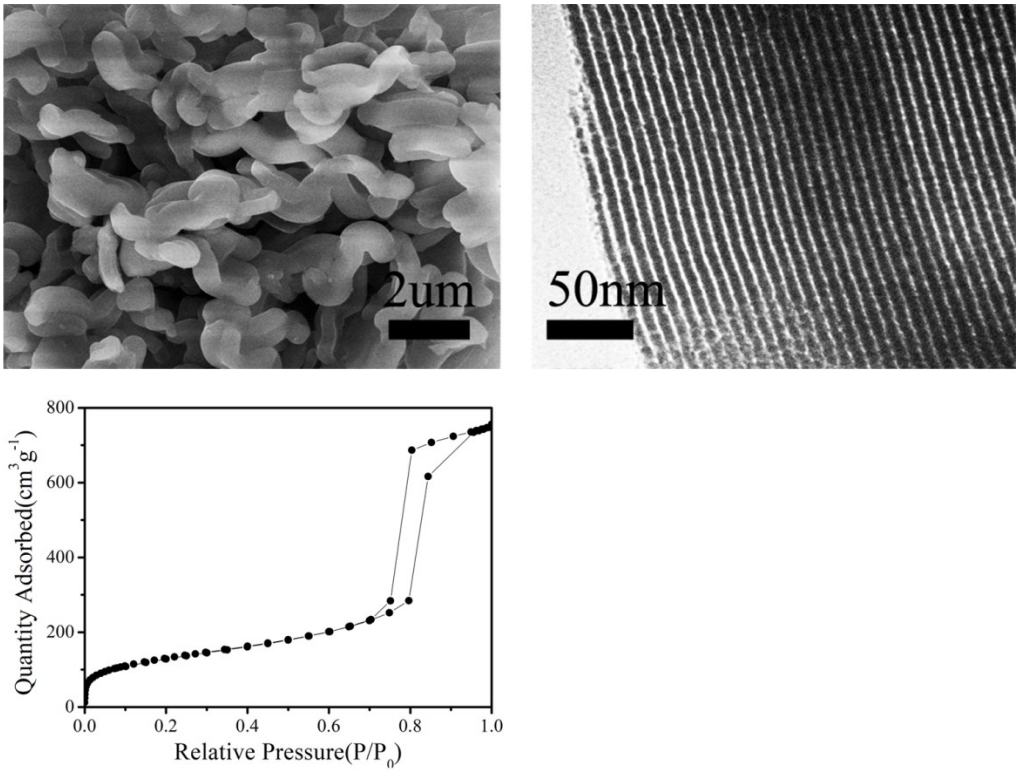

Fig. S1 Structural characterization of typical SBA-15 silica template and nitrogen adsorption-desorption isotherms of SBA-15.

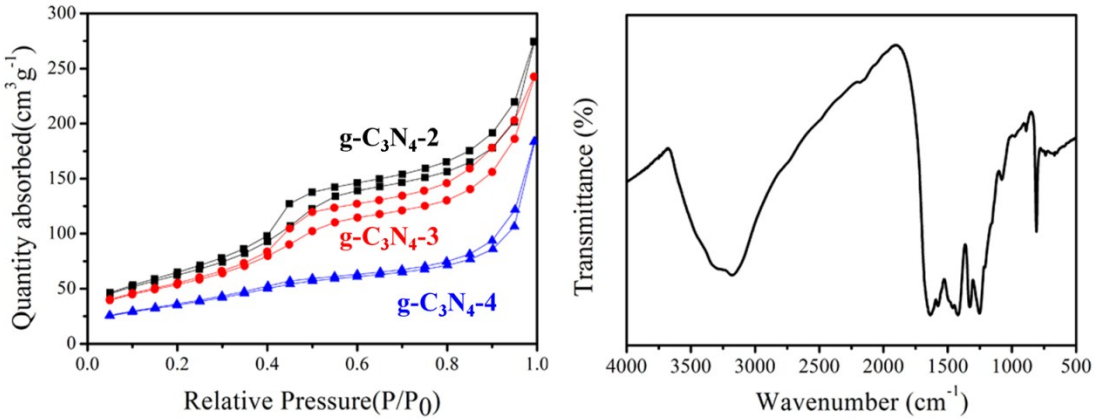

Fig. S2 Nitrogen adsorption-desorption isotherms of g-C_3N_4 samples and FT-IR spectra of g-C_3N_4.

In **Fig. S2**, g-C_3N_4-2 was synthesized by vacuuming for 5 hours and calcining at 550 °C for 5 hours. g-C_3N_4-3 was synthesized by vacuuming for 4 hours and calcining at 580 °C for 4 hours. g-C_3N_4-4 was synthesized by vacuuming for 4 hours and calcining at 550 °C for 5 hours. The specific surface areas of g-C_3N_4-2, g-C_3N_4-3, g-C_3N_4-4 are 259.0, 223.0, 160.0 m^2 g^{-1}, respectively.

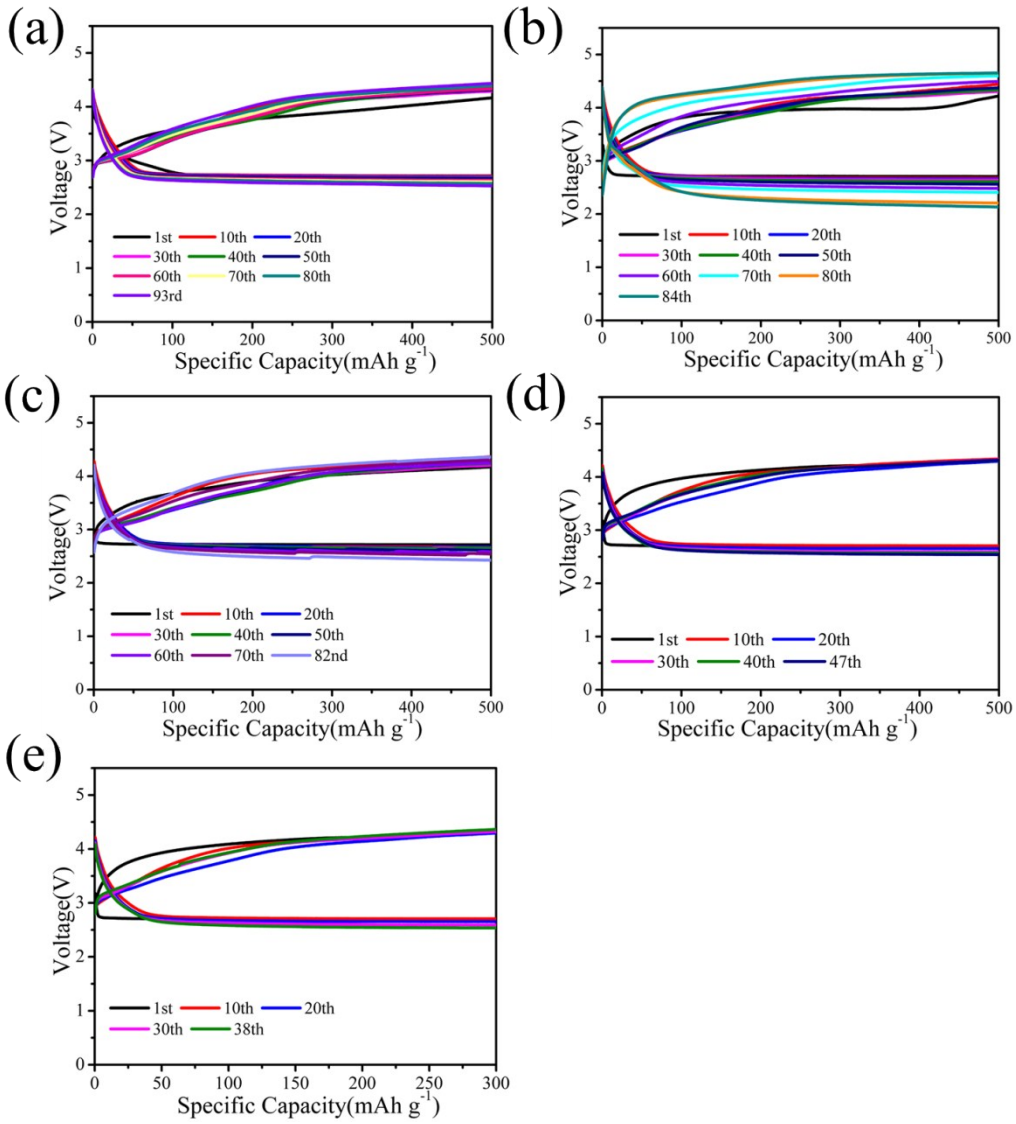

Fig. S3 Cycles of Li-O_2 batteries with WC-2 (a), WC-3 (b), WC-4 (c), g-C_3N_4 (d) and hard carbon (e) under limited capacity of 500 mAh g^{-1} at 100 mA g^{-1}.

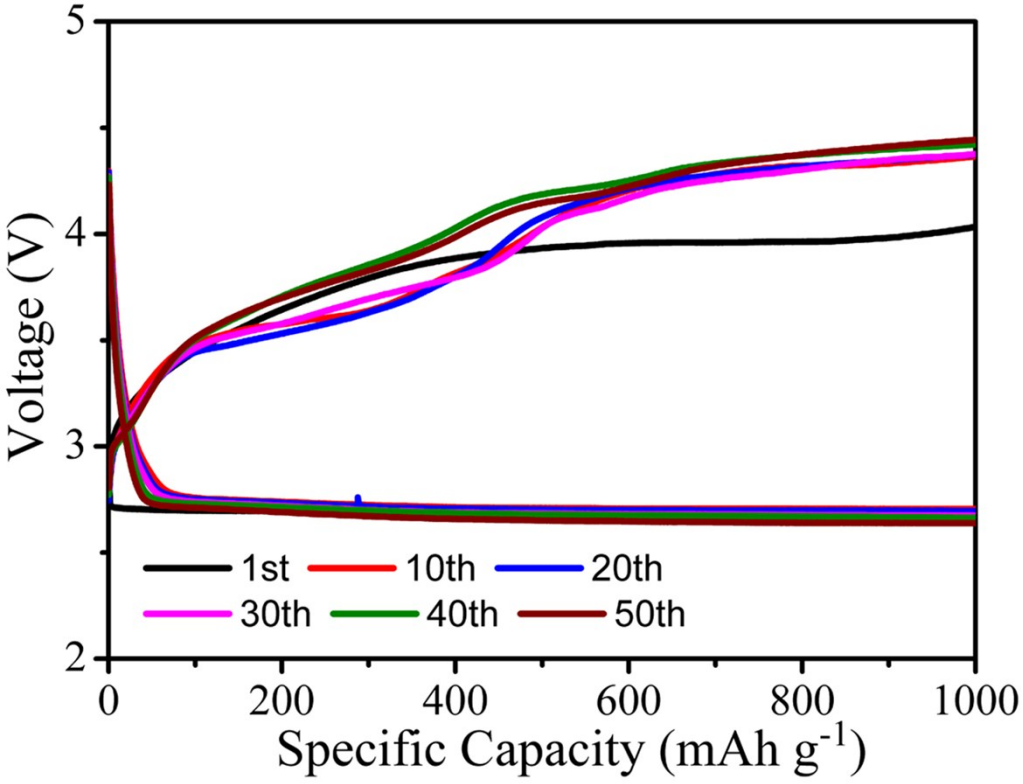

Fig. S4 Cycles of Li-O_2 batteries with WC-1 under limited capacity of 1000 mAh g^{-1} at 100 mA g^{-1}.

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