

Supplementary Information for Rechargeable Li/CO₂:O₂ (2:1) battery and Li/CO₂ battery

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Supplementary Tables

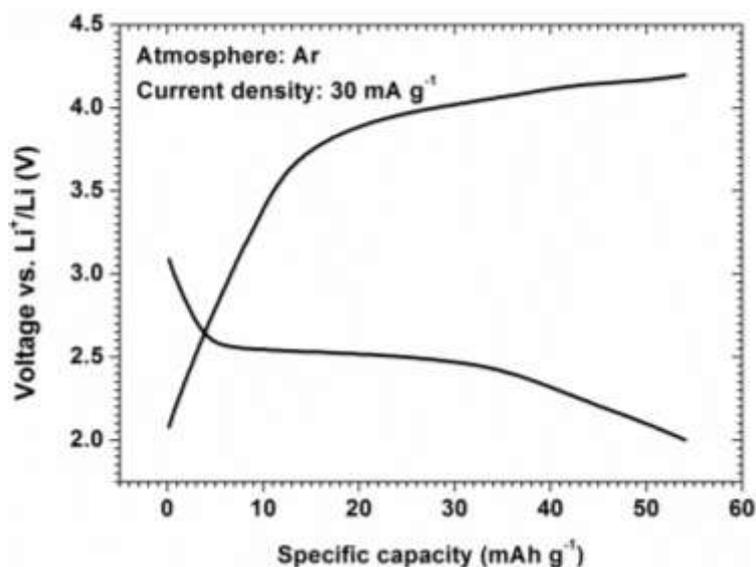
	Carbon (atomic %)	Oxygen (atomic %)	Fluorine (atomic %)
Pristine	94.82	1.85	3.19
First discharge	45.60	45.19	8.19
First charge	92.48	5.23	2.09
Fifth discharge	40.75	52.26	6.99
Fifth charge	88.78	6.84	4.38

Supplementary Table S1 The C, O and F atomic percentage composition in the KB electrode in the pristine, in the first discharge, in the first charge, in the fifth discharge and in the fifth charge state of the Li/CO₂:O₂ battery.

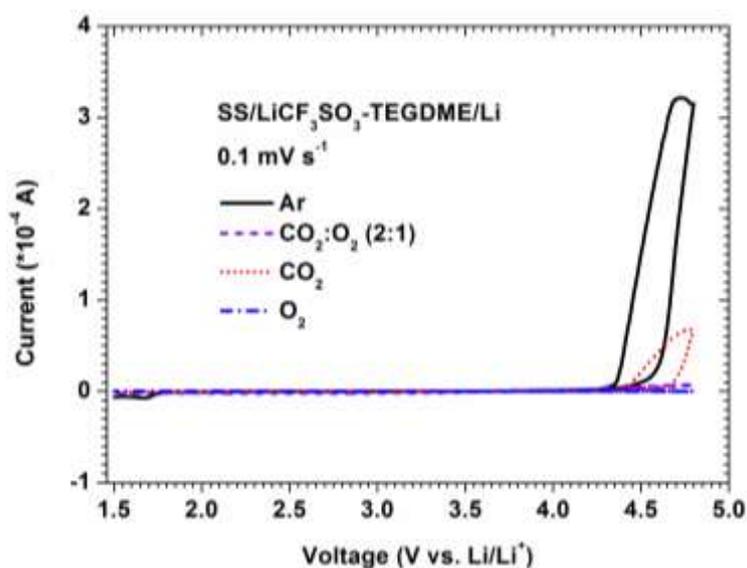
	Carbon (atomic %)	Oxygen (atomic %)	Fluorine (atomic %)
Pristine	94.82	1.85	3.19
First discharge	45.47	52.86	7.11
First charge	87.54	7.89	4.35
Fifth discharge	45.43	48.08	4.41
Fifth charge	87.61	6.07	5.86

Supplementary Table S2 The C, O and F atomic percentage composition in the KB electrode in the pristine, in the first discharge, in the first charge, in the fifth discharge and in the fifth charge state of the Li/CO₂ battery.

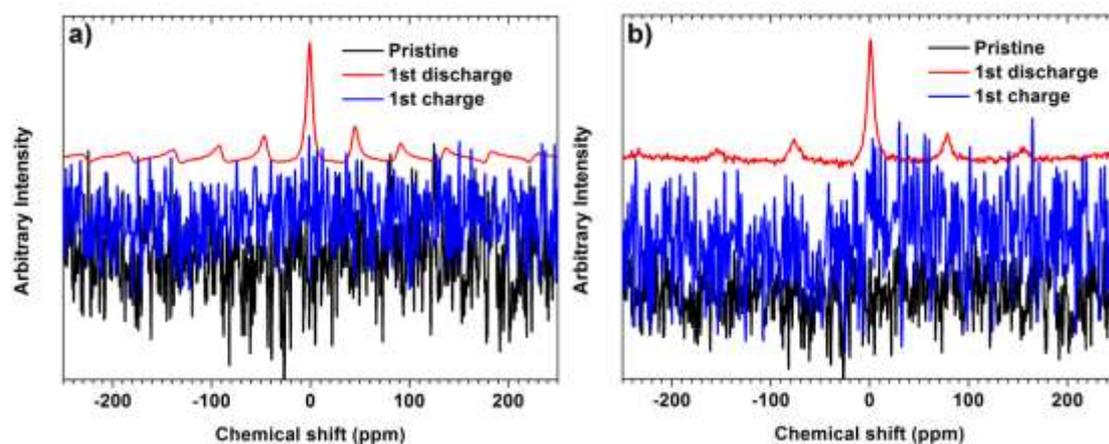
Supplementary Figures



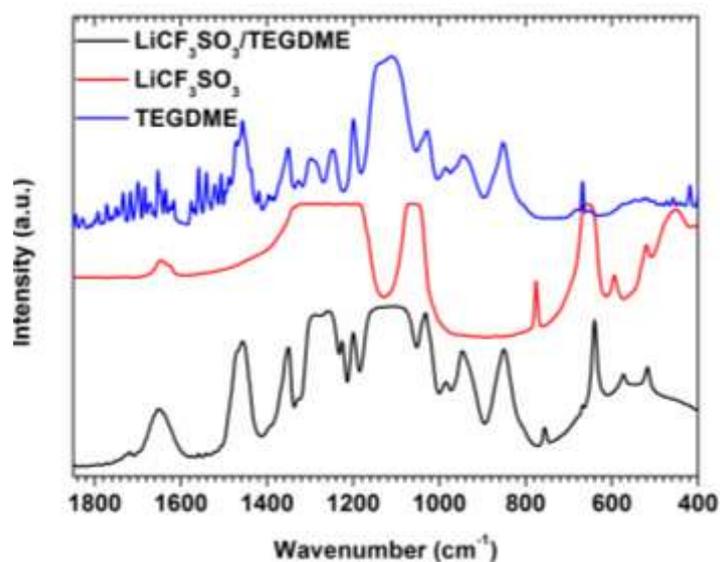
Supplementary Fig. S1 Charge-discharge curves of lithium battery with Ar as working gas. The cut-off voltage of discharge is 2.0 V. The current density is 30 mA g⁻¹. The cathode is KB and PTFE at a weight ratio of 90:10.



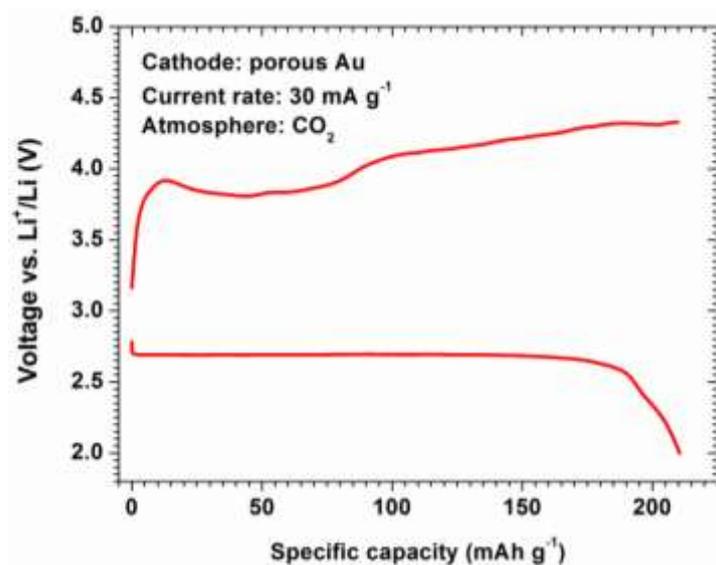
Supplementary Fig. S2 The cyclic voltammograms of LiCF₃SO₃ in TEGDME at a molar ratio of 1:4 under Ar (solid line), CO₂:O₂ (2:1) mixture (dash line) and CO₂ (dot line). The working electrodes are all stainless steel. The counter and reference electrodes are lithium foil. The rate is 0.1 mV s⁻¹.



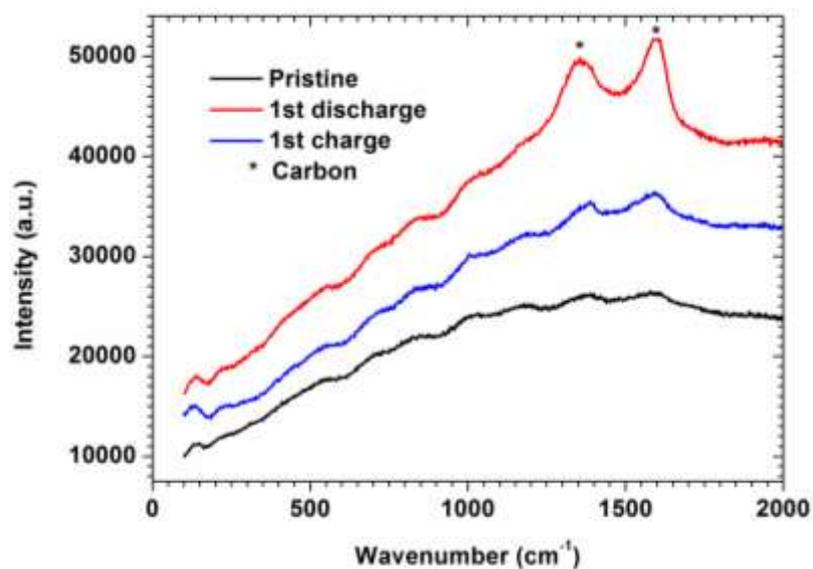
Supplementary Fig. S3 ^7Li NMR spectra of the KB electrode in the pristine, first discharge and first charge state in the a) $\text{Li}/\text{CO}_2:\text{O}_2$ (2:1) battery and b) Li/CO_2 battery. The rotate speed for the sample is 7000 Hz in a) and 12000 Hz in b).



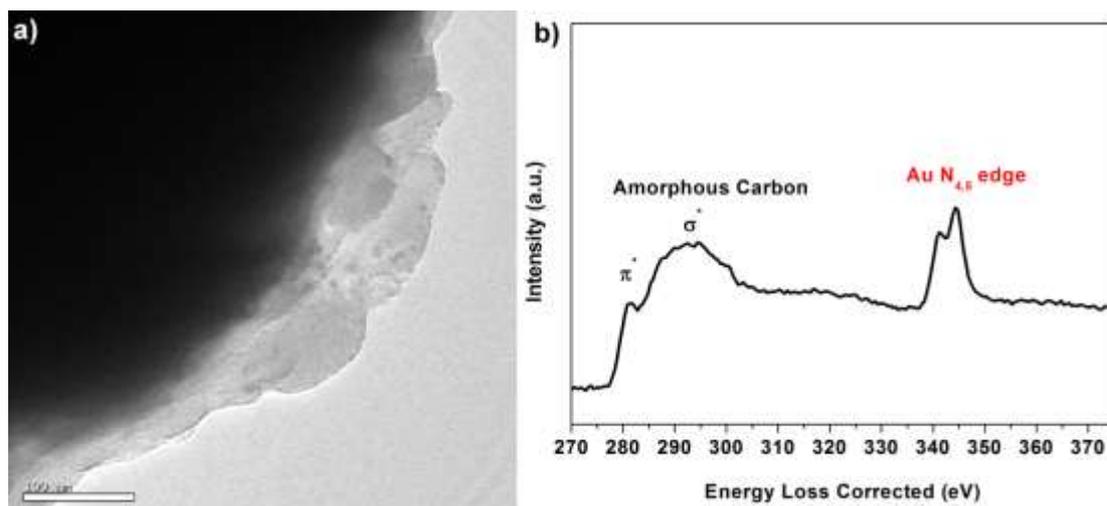
Supplementary Fig. S4 The FTIR spectra of the $\text{LiCF}_3\text{SO}_3/\text{TEGDME}$ (1:4, molar ratio) electrolyte (black), LiCF_3SO_3 (red) and TEGDME (blue).



Supplementary Fig. S5 Charge-discharge curves of Li/CO₂ battery with porous Au as cathode. The cut-off voltage of discharge is 2 V. The current density is 30 mA g⁻¹.



Supplementary Fig. S6 Raman spectra of porous gold in the pristine (black), first discharge (red) and first charge state (blue) in Li/CO₂ battery.



Supplementary Fig. S7 The a) TEM and b) EELS of the porous gold electrode in the first discharge state in Li/CO₂ battery.