Electronic Supplementary Information

Lithium-oxygen batteries with ester-functionalized ionic liquid-based electrolytes

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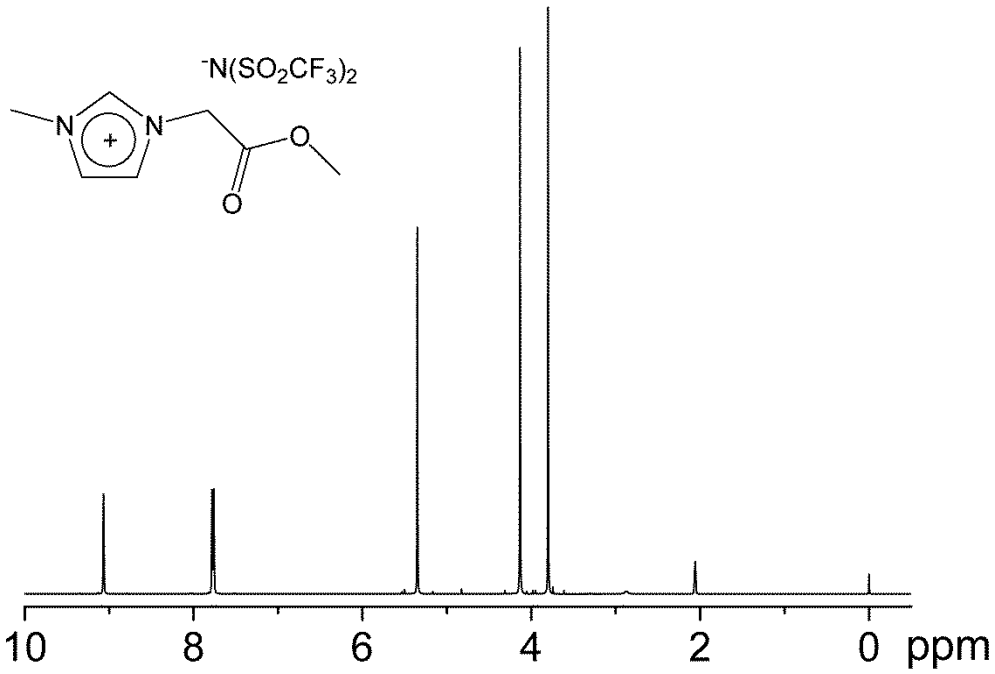

Fig. S1. ^{1}H NMR spectrum of MMEsIm-TFSI in acetone-d_6.

^{1}H NMR (400 MHz, acetone-d_6, 25 ^{o}C): δ (ppm) = 9.06, 7.77 (s, d, 3H, CH-Im), 5.35 (s, 2H, CH_2), 4.12 (s, 3H, CH_3N), 3.79 (s, 3H, CH_3O).

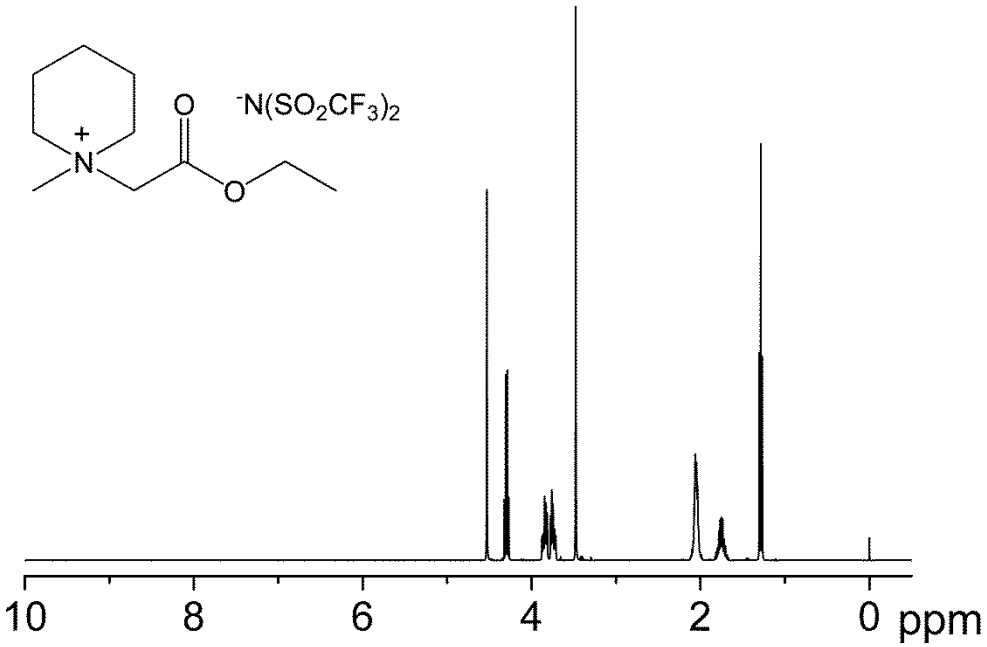

Fig. S2. ^{1}H NMR spectrum of MEEsPip-TFSI in acetone-d_6.

^{1}H NMR (400 MHz, acetone-d_6, 25 ^{o}C): δ (ppm) = 4.51 (s, 2H, N-CH_2-CO), 4. 28 (q, 2H, O-CH_2-C), 3.66-3.92 (m, 4H, N-CH_2-C), 3.49 (s, 3H, N-CH_3), 2.07 (m, 4H, C-CH_2-C), 1.77 (m, 2H, C-CH_2-C), 1.30 (t, 3H, C-CH_3).

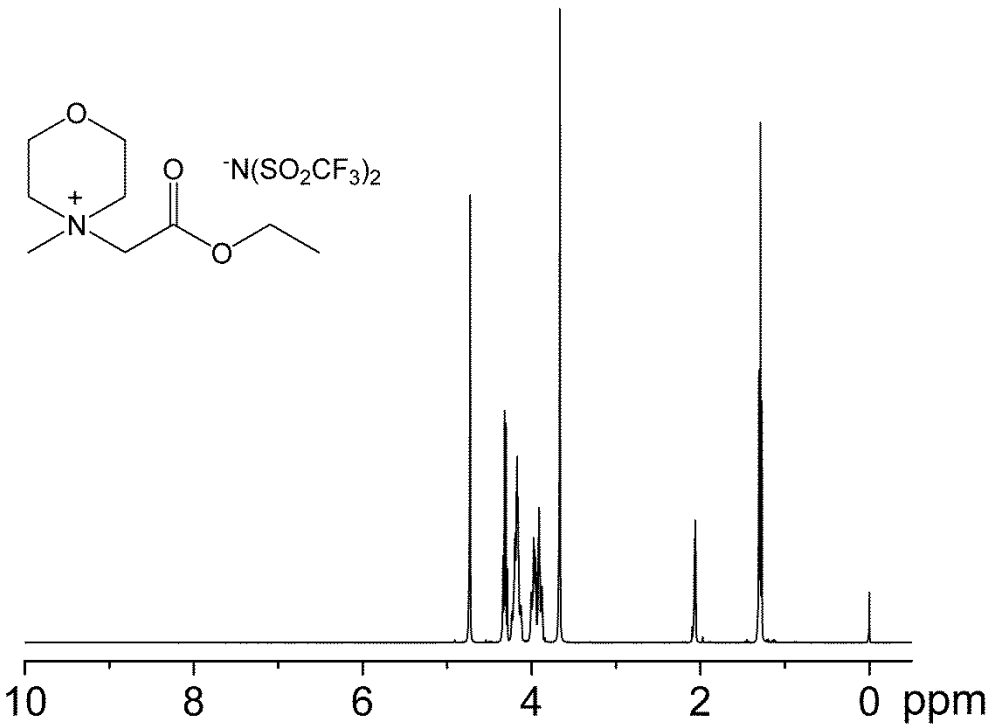

Fig. S3. ^{1}H NMR spectrum of MEEsMor-TFSI in acetone-d_6.

^{1}H NMR (400 MHz, acetone-d_6, 25 ^{o}C): δ (ppm) = 4.73 (s, 2H, N-CH_2-CO), 4.32 (q, 2H, O-CH_2-C), 4.17 (m, 4H, N-CH_2-C), 3.82-4.06 (m, 4H, O-CH_2-C), 3.67 (s, 3H, N-CH_3), 1.28 (t, 3H, C-CH_3).

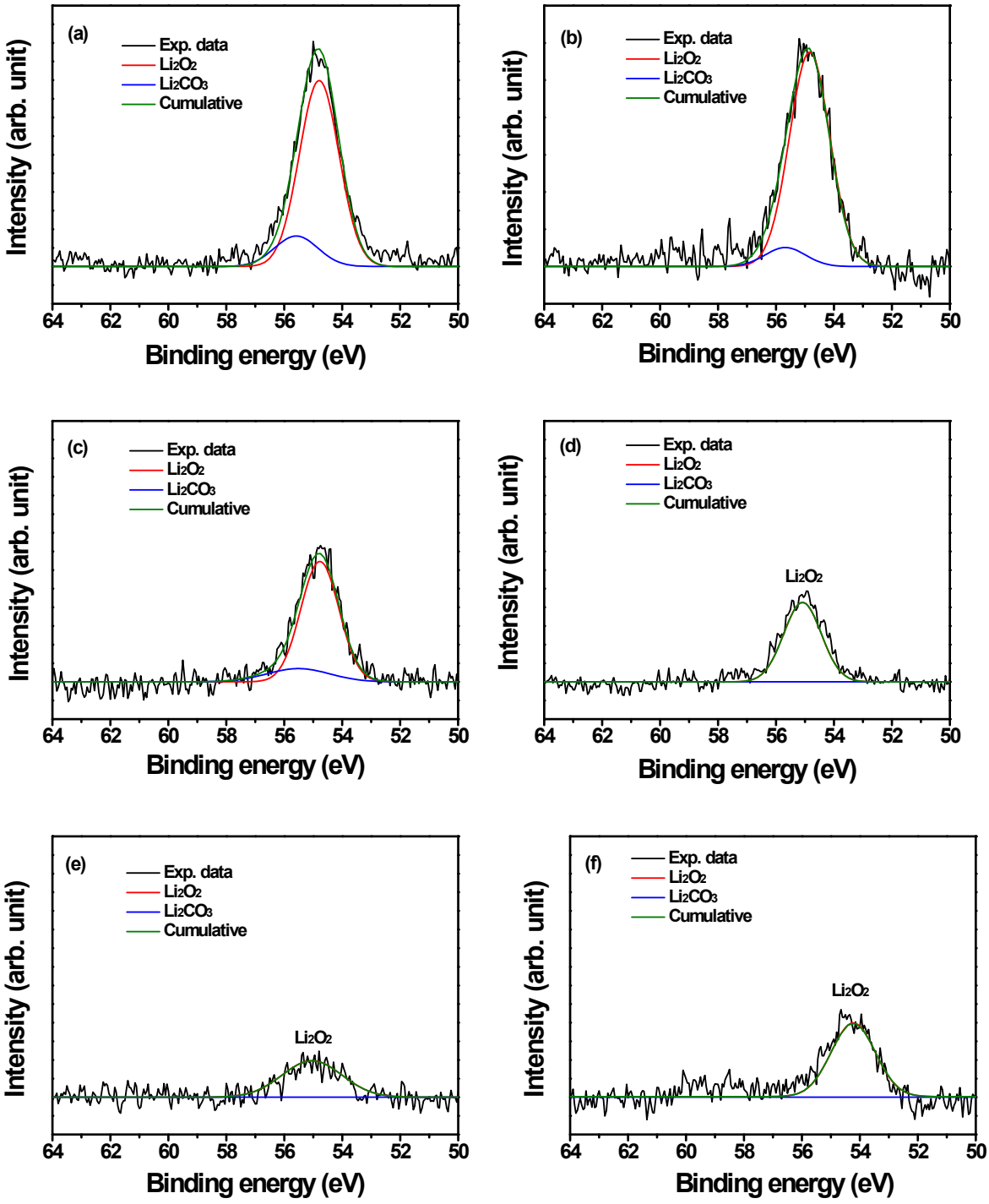

Fig. S4. XPS Li 1s spectra of the fully discharged carbon electrodes employing (a) PYR-0, (b) PYR-25, (c) PYR-50, (d) PYR-75, (e) PYR-100 and the fully charged carbon electrode employing (f) PYR-0. The peaks corresponding to Li_2CO_3 in (d), (e) and (f) could not be observed.

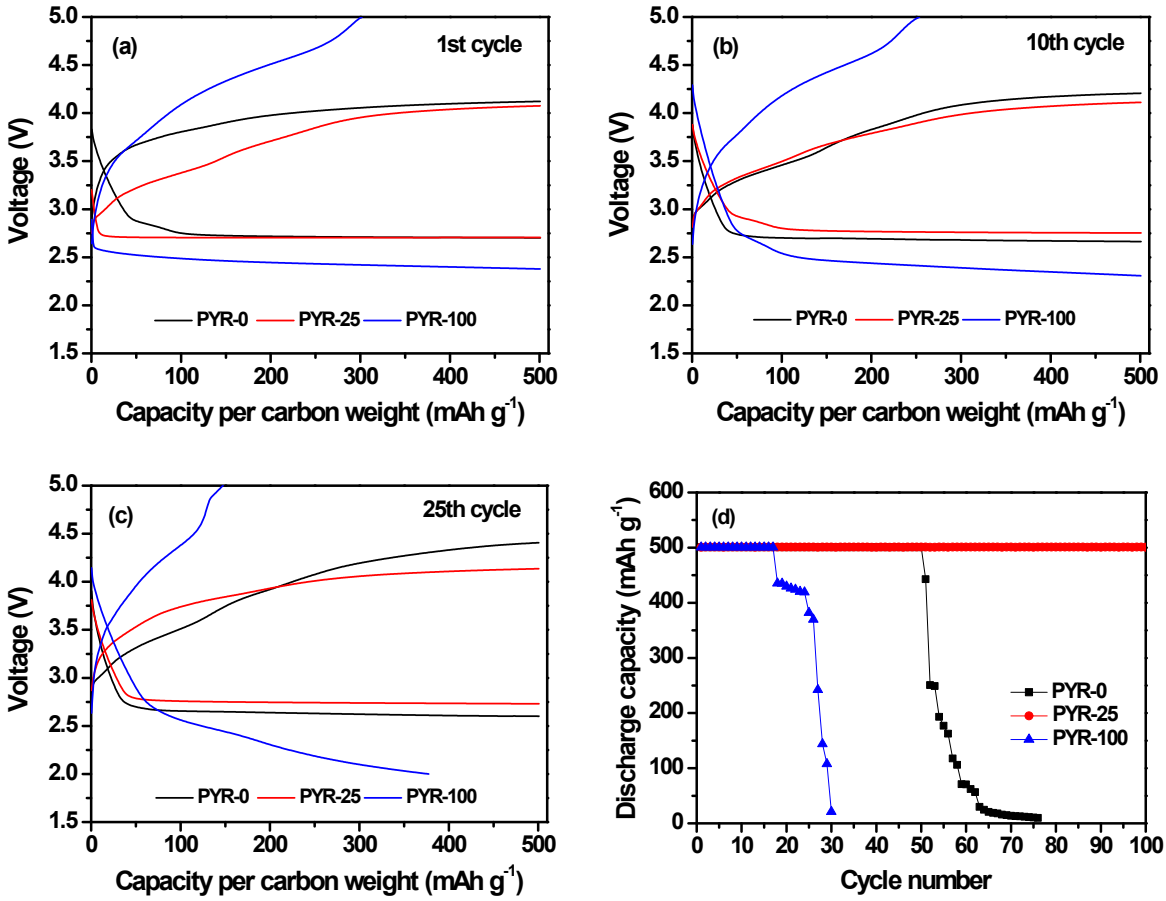

Fig. S5. Discharge and charge curves of lithium-oxygen cells employing different electrolytes at a constant current density of 0.1 mA cm^{-2} (100 mA g^{-1}); the capacity utilization was limited to 500 mAh g^{-1}. (a) 1st cycle, (b) 10th cycle and (c) 25th cycle. Discharge charge capacities of lithium-oxygen cells assembled with different electrolytes as a function of the cycle number. Carbon loading in the carbon electrode was 1.0 mg cm^{-2}.

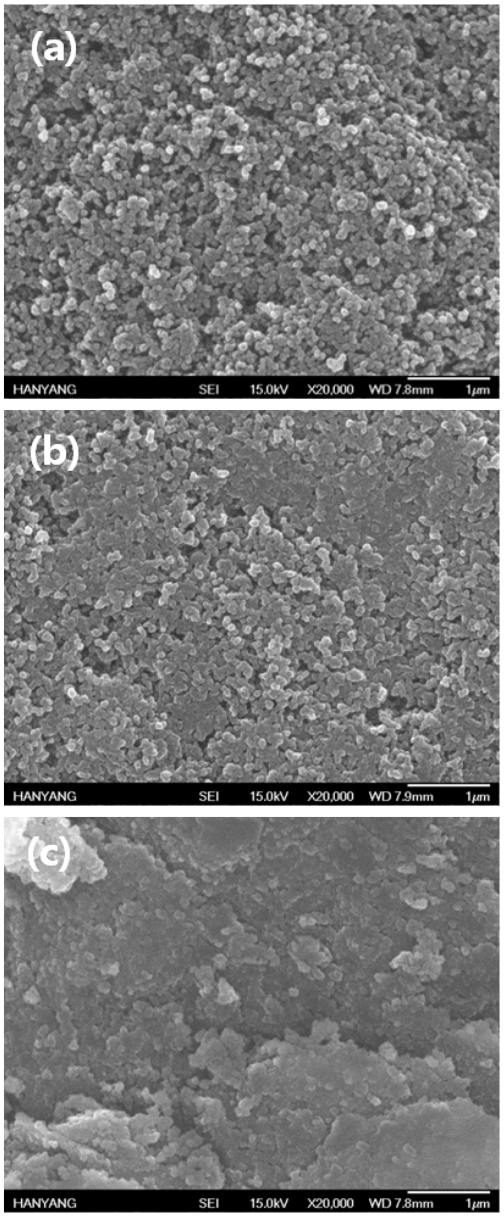

Fig. S6. SEM images of the carbon electrodes (a) before discharge (pristine), (b) after the 1st discharge cycle and (c) after the 100th discharge cycle.