Electronic Supplementary Material (ESI) for Materials Advances.

Self-Standing Porous Carbon Electrodes for Lithium-Oxygen Batteries with Lean Electrolyte and High Areal Capacity Condition

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Keywords: lithium-oxygen batteries, carbon powder-based self-standing membrane, lean electrolyte, high-energy-density, non-solvent-induced phase separation

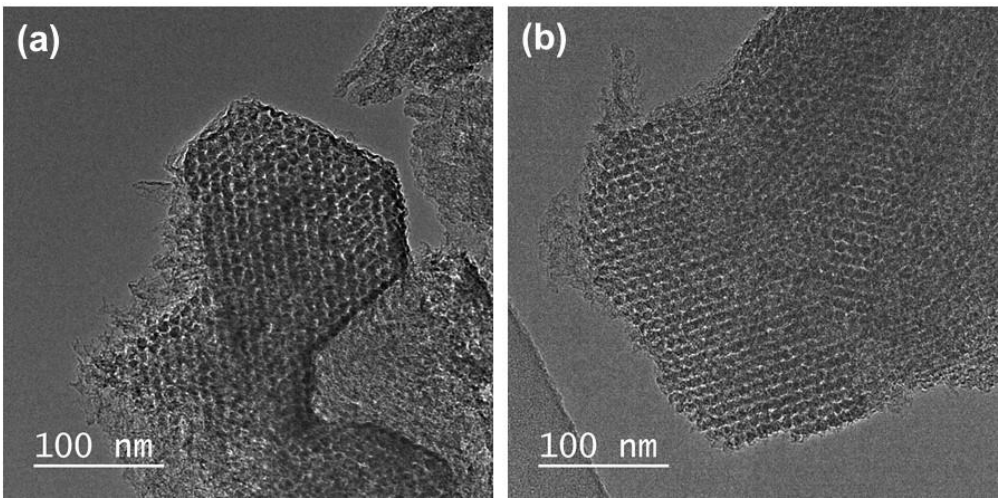

Figure S1. TEM images of (a) CMK powder and (b) CMK-based membrane.

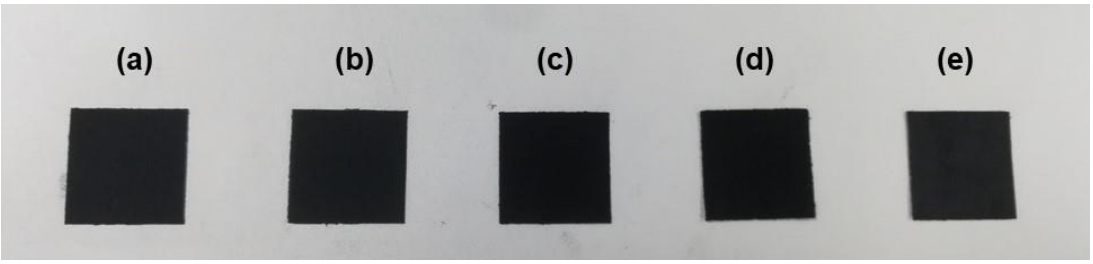

Figure S2. Photographic images of (a) SuperP-, (b) VXC-, (c) Black pearl-, (d) KB-, and (e) CMK-based self-standing membranes

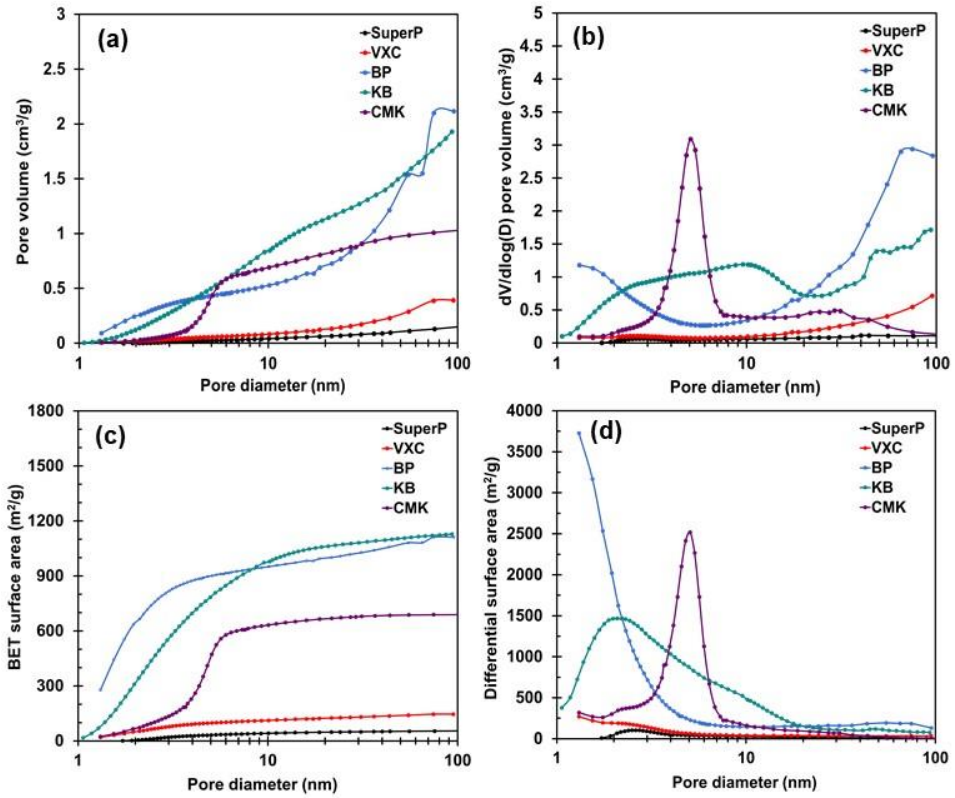

Figure S3. Pore volume and BET surface area of series of carbon powders

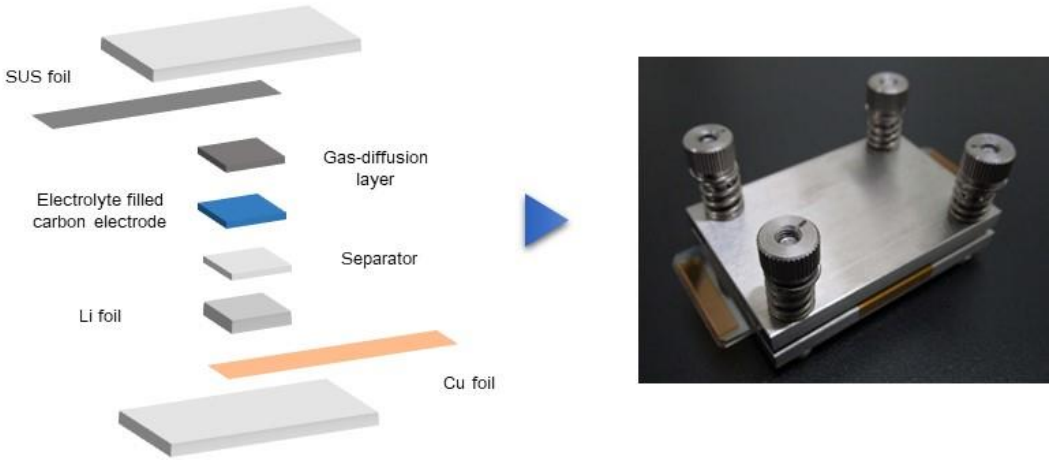

Figure S4. Schematic illustration of cell configuration

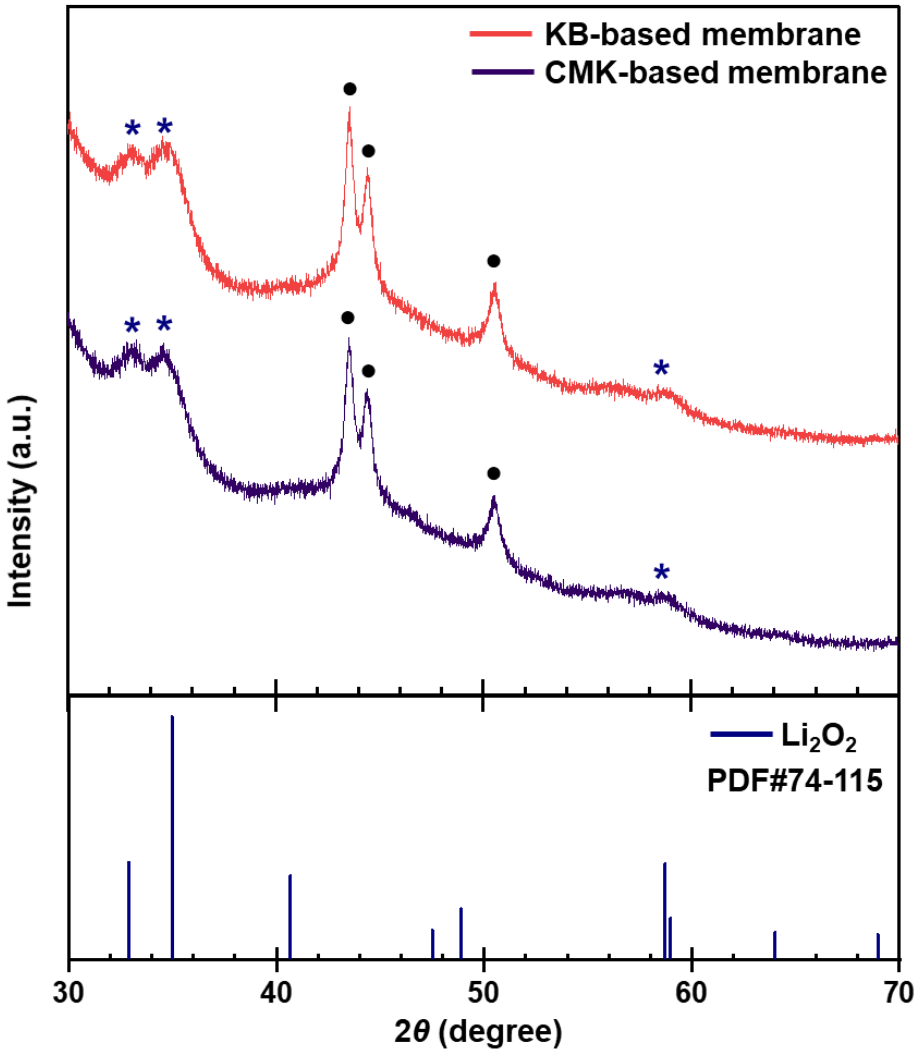

Figure S5. XRD patterns of the Li_2O_2, KB-, and CMK-based membranes after discharge process. The *symbols, and ●symbols denote Li_2O_2 crystal, and SUS-based sample folder, respectively.

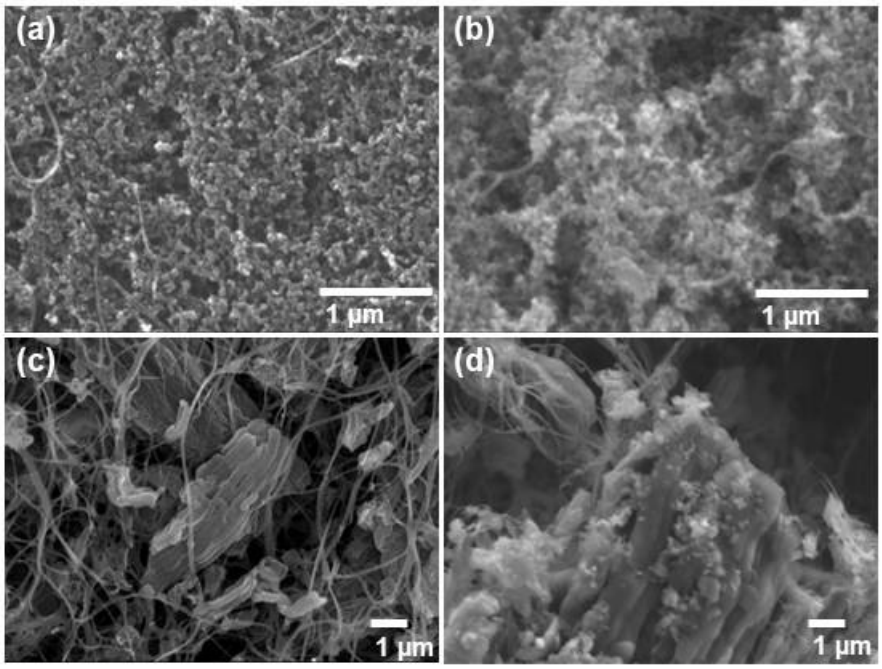

Figure S6. SEM images of (a,b) KB-, and (c,d) CMK-based membranes (a,c) before and (b,d) after discharge process.

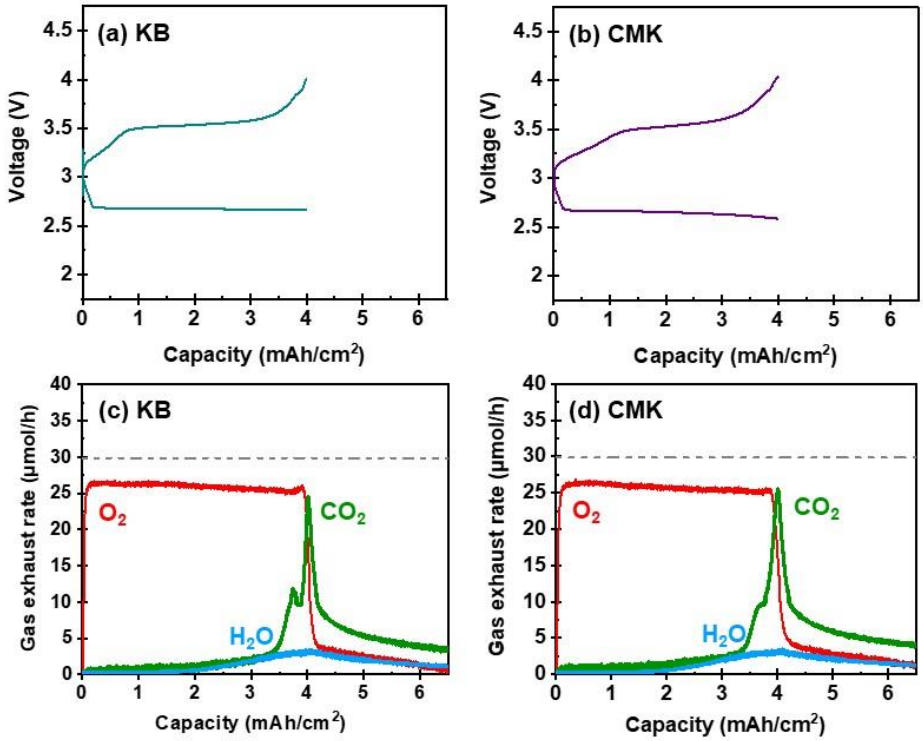

Figure S7. On-line electrochemical mass spectroscopy analysis of first cycle: (a,b) discharge/charge profiles; corresponding (c,d) O_2, CO_2, and H_2O exhaust rates during first charging of KB-, and CMK-based membranes. Dash gray lines indicate the theoretical O_2 evolution rate

Table S1. The performance of LOBs with low E/C conditions (E/C < 20 g/Ah) investigated in the present study and reported in the literature.

carbon electrode		amount of electrolyte (mg/cm^2)	areal capacity (mAh/cm^2)	E/C (g/Ah)	cycle number	ref number
details	mass loading (mg/cm^2)					
KB	5.5	25.80	4.00	6.5	30	This work
KB	5.5	20.50	4.00	5.1	15	This work
KB	5.5	15.20	4.00	3.8	1	This work
CMK	5.8	28.30	4.00	7.1	30	This work
CMK	5.8	22.60	4.00	5.7	20	This work
CMK	5.8	17.00	4.00	4.3	11	This work
KB	1.00	8.30	3.00	2.8	6	23
KB	5.40	28.20	4.00	7.1	37	23
Graphene	2.00	60.00	2.00	30.0	18	27
CNT	0.20	59.80	12.60	4.7	11	40
CNT	0.20	59.80	1.20	49.8	170	40
SuperP	30.00	40.82	13.45	3.0	2	41
SuperP	30.00	40.82	9.74	4.2	3	41
SuperP	30.00	40.82	6.70	6.1	4	41
SuperP	30.00	40.82	3.38	12.1	8	41
CNT	7.50	87.50	10.00	8.8	7	42
CNT	7.50	87.50	4.50	19.4	40	42
CNT	7.50	87.50	3.00	29.2	45	42
MoS2	0.40	52.00	1.00	52.0	190	43
CNT	6.66	83.30	2.00	41.7	23	44