Investigation of the Mechanism of Metal-organic Frameworks in Preventing Polysulfides Shuttling - From the Perspective of Composition and Structure

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Figure S1

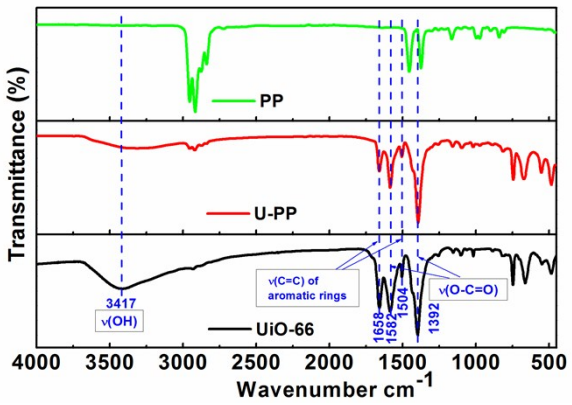

Figure S1. The Fourier transform infrared (FTIR) spectra of UiO-66, pristine PP membrane and U-PP membrane.

Figure S2

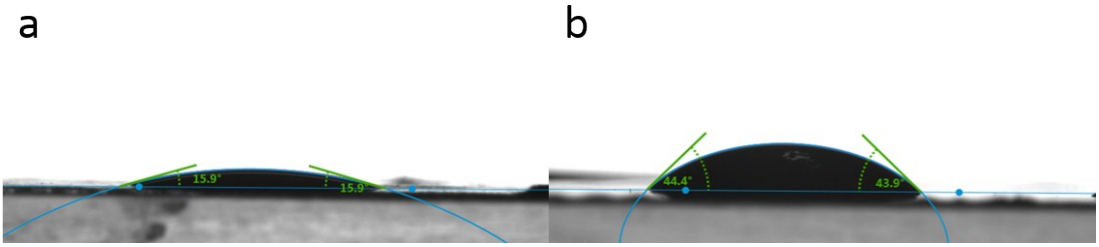

Figure S2. Contact angle of (a) U-PP and (b) PP membrane with electrolyte.

Figure S3

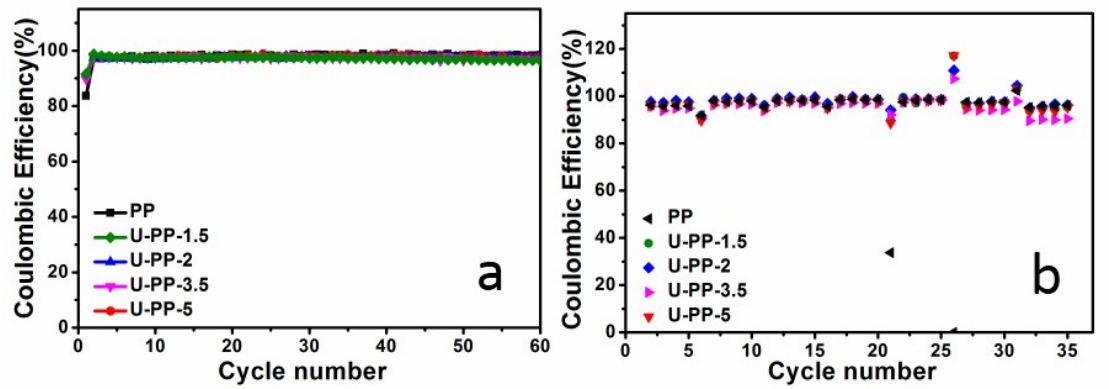

Figure S3. Coulombic efficiency of (a) cycle and (b) rate tests for LSBs with pristine PP separator and U-PP separators with different thickness of UiO-66 layer.

Figure S4

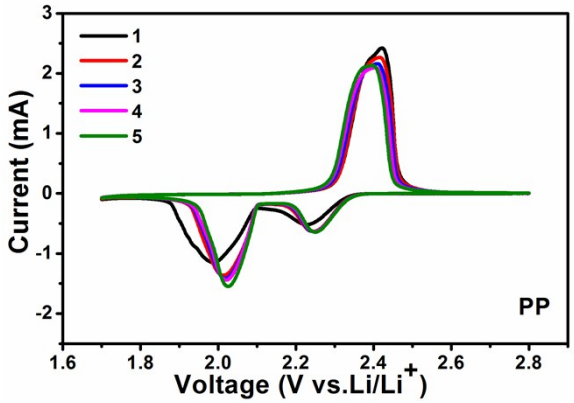

Figure S4. CV curves of the LSB with PP separator at different cycles.

Figure S5

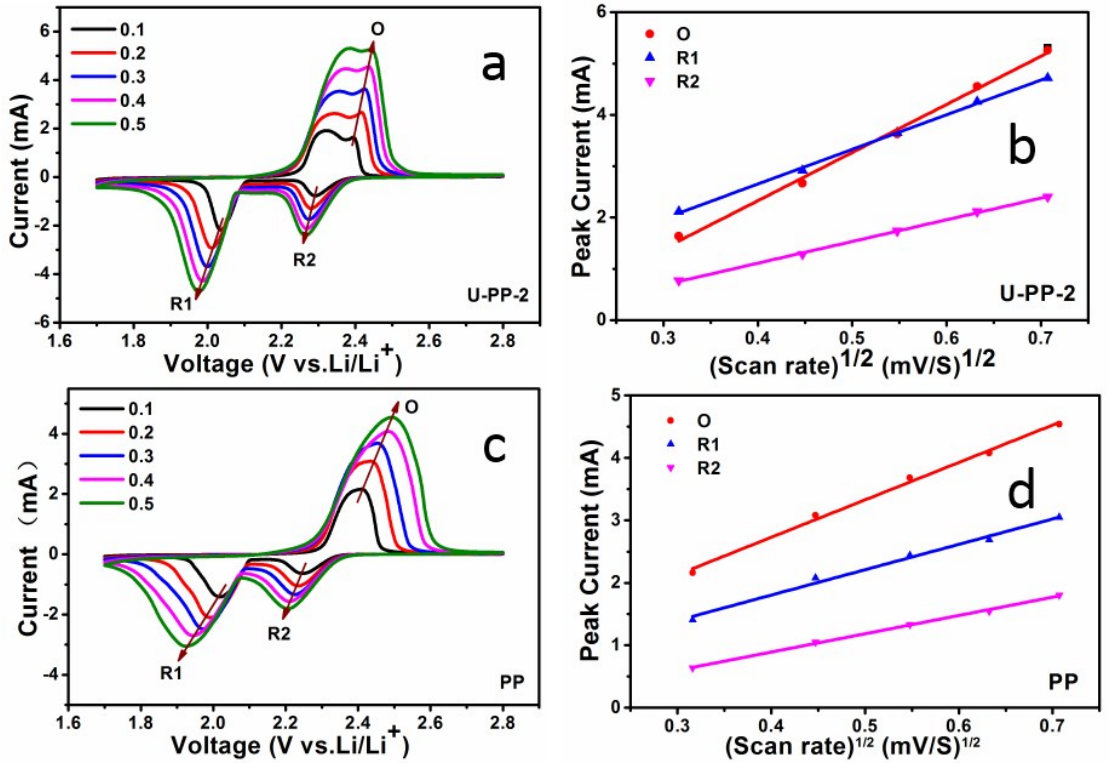

Figure S5. CV curves with different scan rates (a, c) and the linear fits of I_P vs. $v^{1/2}$ of the LSBs with U-PP-2 and PP separators (b, d).

Figure S6

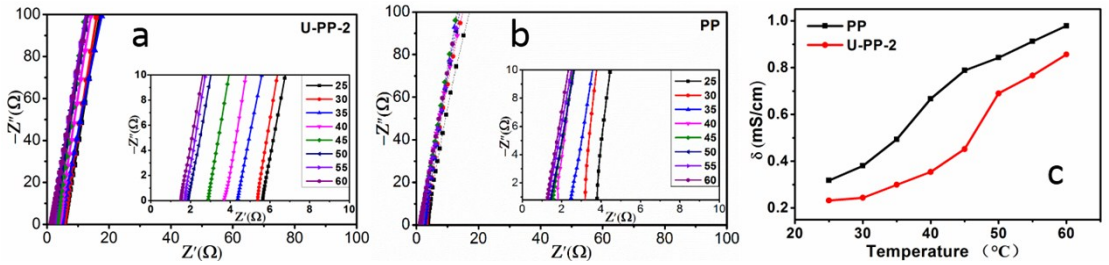

Figure S6. The EIS (a, b), and the lithium ion conductivity (c) of blocking cells composed of stainless steel (SS)/membrane/SS with U-PP-2 and PP separators at 25 to 60 °C.

Figure S7

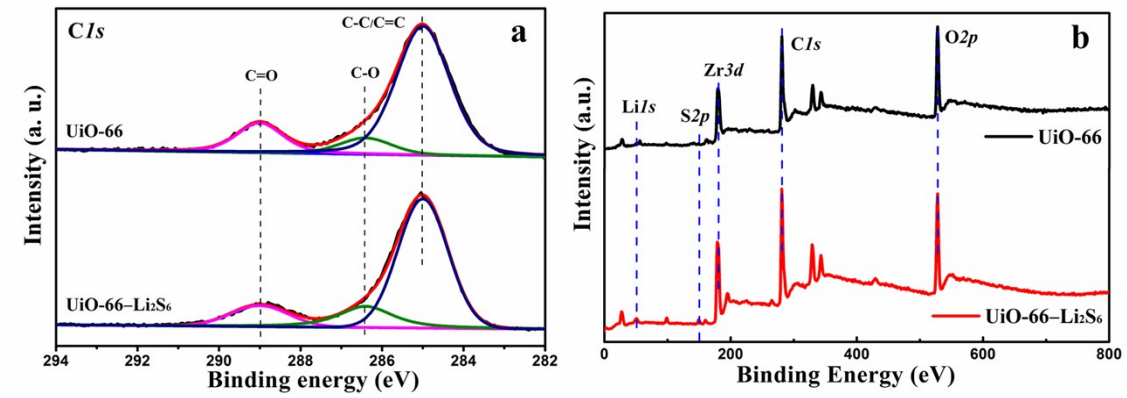

Figure S7. Comparison of (a) high-resolution XPS spectra of C *1s*, and (b) full spectra of UiO-66 before and after adsorption.

Table S1. Li^+ diffusion coefficiency for different peaks for the batteries with U-PP-2 and PP separators. (10^{-10} cm^2/S)

	D (O)	*D* (R1)	*D* (R2)
U-PP-2	13.48	6.99	2.74
PP	5.50	2.53	1.31

Table S2. Sulfur contents on the surface of Li anode of the LSBs with different separators after 1 and 100 cycles according to the EDS mapping.

PP 1st			**U-PP-2 1st**		**PP 100th**		**U-PP-2 100th**	
Element	Weright %	Atomic %	Weright %	Atomic %	Weright %	Atomic %	Weright %	Atomic %
C K	5.68	7.72	3.31	4.58	6.26	10.83	9.76	13.42
O K	81.68	83.29	78.36	81.41	37.52	48.75	72.3	74.64
F K	7.3	6.27	12.83	11.23	8.9	9.74	8.31	7.23
S K	5.34	2.72	5.3	2.75	47.33	30.69	8.88	4.58
Zr K			0.2	0.04			0.75	0.14

Table S3. Ionic conductivity comparison of the MOFs containing composite separators.

MOF-based membranes	**Thickness (μm)**	**Ionic conductivity (mS cm^{-1})**	**R_0 (Ω)**	**S loading (mg cm^{-2})**	**Ref**
UiO-66-NH_2@SiO_2/Celgard 2320	55-60	~0.1	~4.5	0.5	
HKUST-Cu/GO	22	0.072		0.3	
Ce-MOF-808/CNT)/Celgard	33			2.5-6	
HKUST-Zn/GO	18			0.6-0.8	
Cu_2(CuTCPP)/Celgard	25.5		8	2	
HKUST-Cu@PVDF-HFP	28	0.094/0.138	9/4.7	1-1.5	
PSS@HKUST-1/Celgard	29.2	0.015		1.3-4.3-11.27	
Prussian blue@Celgard	29.1	0.132	2.9-3.4		
UiO-66@Celgard	27	0.232	2.13	2.5-3	This work