Supporting Information

Highly Fluoro-Substituted Covalent Organic Framework and Its Application in Lithium-Sulfur Battery

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1. FT-IR spectra.

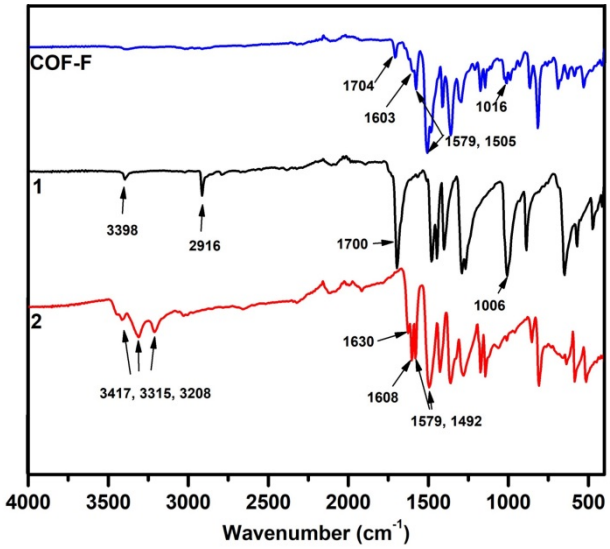

Figure S1. FT-IR spectra of **1**, **2** and polymer **COF-F**.

2. ^{13}C Solid NMR spectrum of COF-F.

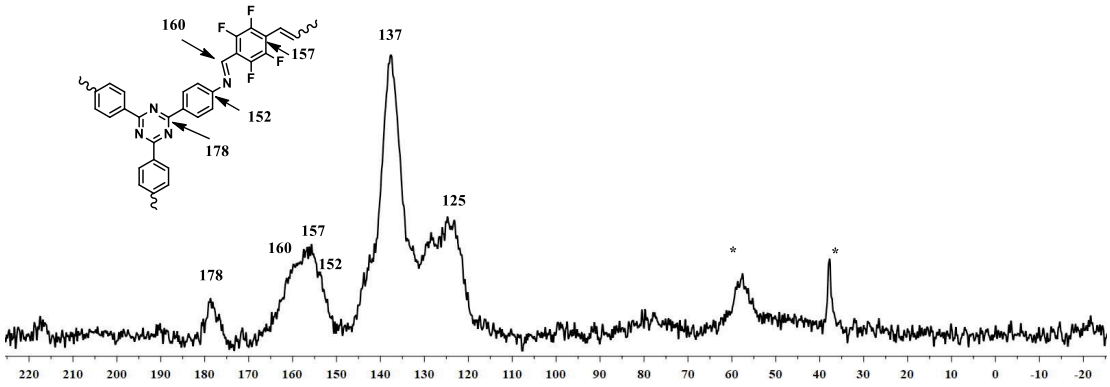

Figure S2. ^{13}C CP MAS NMR spectrum of the polymer **COF-F**.

3. TGA graphs of COF-F, COF-F-S, POP-F, and POP-F-S

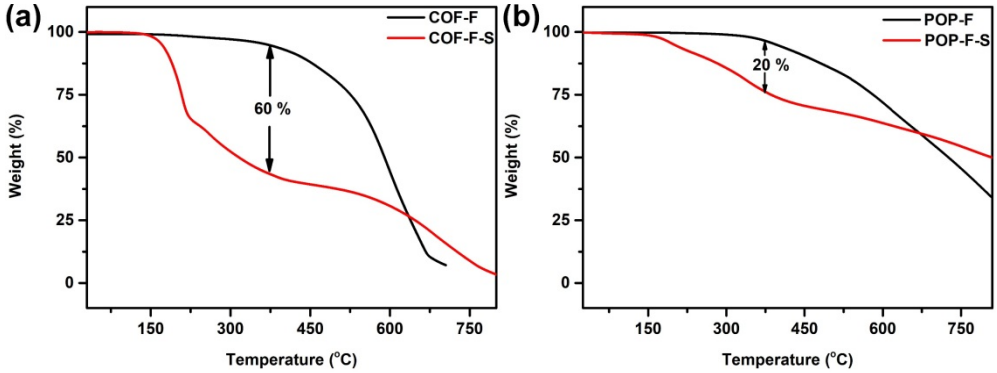

Figure S3. TGA curves of **COF-F** and **COF-F-S** (a), **POP-F** and **POP-F-S** (b).

4. XRD patterns of POP-F, COF-F-S and POP-F-S.

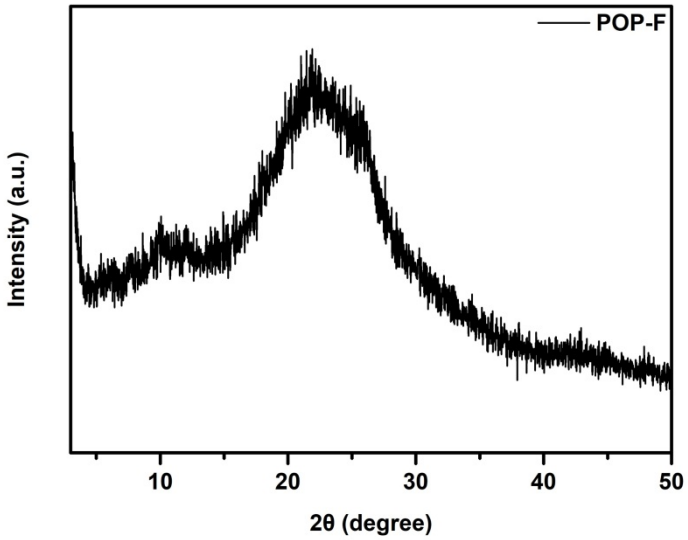

Figure S4. PXRD patterns of **POP-F**.

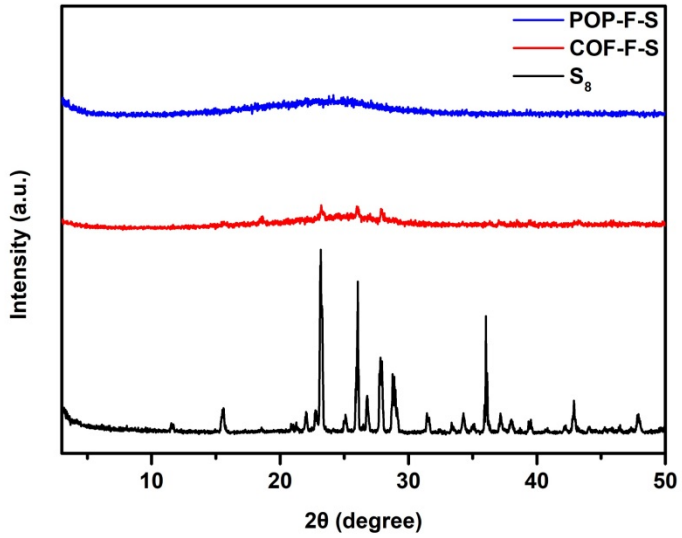

Figure S5. PXRD patterns of **COF-F-S** and **POP-F-S**.

5. Structural modeling and X-ray diffraction analyses

Table S1. Refined unit cell parameters and fractional atomic coordinates for **COF-F**.

Name	COF-F		
Space group	*P6/m*		
***a* (Å)**	25.947		
***c* (Å)**	3.045		
Atom name	***x***	***y***	***z***
N1	0.37466	0.69187	0.00000
C2	0.38676	0.63248	0.00000
H3	0.44781	0.69992	0.00000
C4	0.43008	0.65826	0.00000
C5	0.45611	0.64149	0.00000
H6	0.49757	0.66751	0.00000
C7	0.43983	0.59861	0.00000
H8	0.50115	0.60361	0.00000
C9	0.46842	0.58198	0.00000
N10	0.45455	0.54247	0.00000
C11	0.47836	0.52194	0.00000
F12	0.53987	0.57639	0.00000
C13	0.52183	0.54315	0.00000

6. Porous properties of polymers

Table S2. Porous properties of polymers before and after vulcanization

Polymers	S_{BET}(m^2/g)	D_{pore}(nm)	V_{total}(cm^3/g)
COF-F	1530	2.8	0.572
COF-F-S	39	/	/
POP-F	980	2.8	0.861
POP-F-S	43	/	/

7. Elemental analyses

Table S3. Elemental analysis of **COF-F-S** and **POP-F-S**

Polymers	C (wt %)	H (wt %)	N (wt %)	S (wt %)
COF-F-S	13.62	0.20	1.69	60.55
POP-F-S	14.37	0.05	1.76	61.80

8. XPS analyses of polymers

Table S4. Atomic ratios of different F configurations (based on XPS area ratio).

Porous polymers	$F_{C\text{-}F}$ (689.4 eV) Area/Ratio	$F_{semi\text{-}ionic1}$ (687.5 eV) Area/Ratio	$F_{semi\text{-}ionic2}$ (686.0 eV) Area/Ratio
COF-F-S	708.7/43.3%	634.6/38.7%	294.4/18.0%
POP-F-S	269.9/56.9%	130.6/27.5%	74.1/15.6%

9. Raman spectra of COF-F-S and POP-F-S

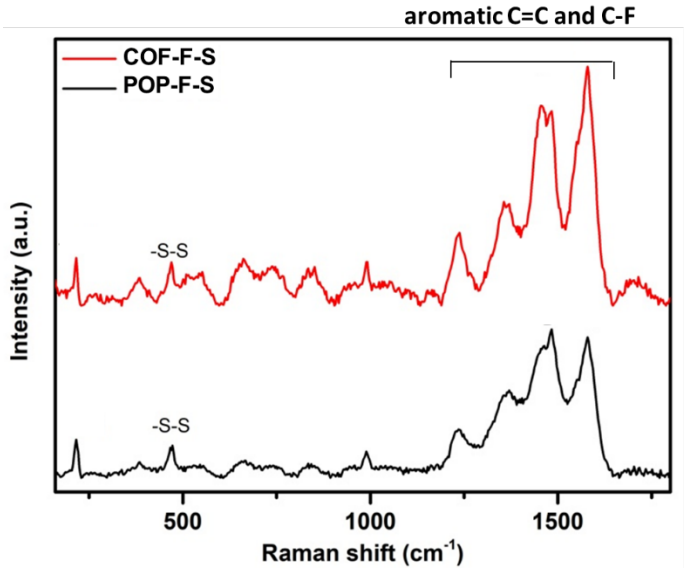

Figure S6. Raman spectra of **COF-F-S** and **POP-F-S**.

10. Electrochemical performance of POP-F-S

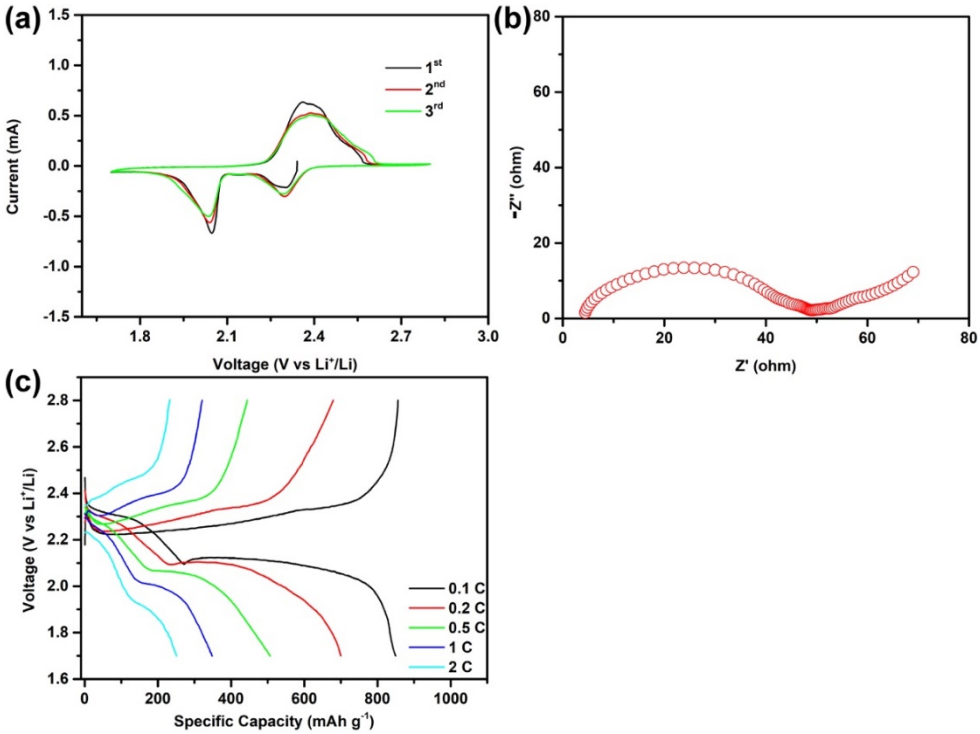

Figure S7. Electrochemical performance of **POP-F-S**: (a) Cyclic voltammetry curves. (b) EIS plot. (c) Charge-discharge profiles at different rates.