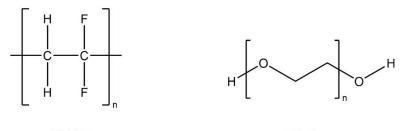
**Supporting Information** 

## Chemical Compatibility of Polymer Binders with Reversible Anionic Redox Reaction in Lithia-based Cathodes<sup>†</sup>

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PVDF

PEO

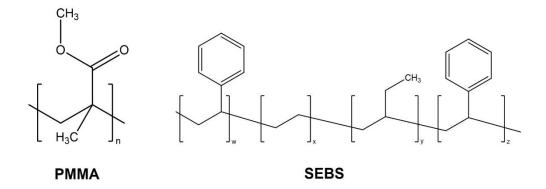


Fig. S1 Chemical structures of polymers studied herein.

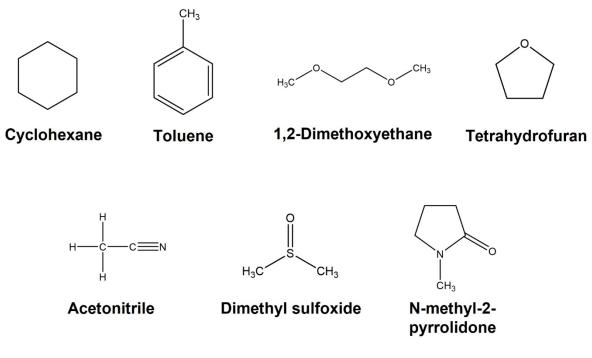


Fig. S2 Chemical structures of various organic solvents studied herein.

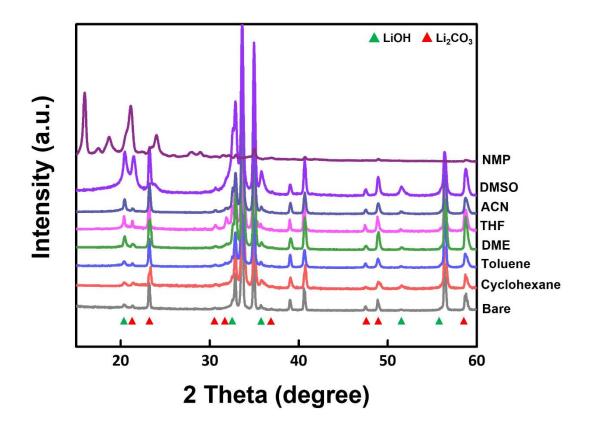


Fig. S3 XRD patterns of pristine lithia and lithia after treatment in various organic solvents.

	Cyclohexane	Toluene	DME	THF	ACN
PVDF	<b>PVDF PVDF PV</b>	DF PVDF PVDF PV	DF PVDF PVDF PV	FPVDFPVDF	PDF PVDF PVDF PV
	DF PVP PVDF PV	DF PVPT ~VDF PV	DF PV VDF PV	FPV rx DF	PDF PVDF PVDF PV
	DF B OF P OF PV	DF PV	DF P DF PV	FH OFPWFI	P DF PV F PV
	DF I OF PU DF PV	DF P <sup>c</sup> //F PV	DF B DF PV	ED TP OF	DF PY
	DF PV VDF PV	DF PVD. VDF PV	DF PVD. PVDF PV	FF UP DF	DFPVB . DFPV
	DF PVDF PVDF PV	NF DVNF DVNF DV	DF PVDF PVDF PV	FPVDFPVDF	P DF PVDF PVDF PV
PMMA	MA PMA PM	A PIVINIA PIVI	MA PINIMA PINI	MA DETA DA	IMA PMALA PM
	and the second se	( A a set of	and the second sec	1110	
		1744	MA MMA PM		MA MMA PM
	and the second		IVILLA COLLEGE A LINA	1 m m m	MA MM/ PM
	MA F W M		MA P. MA		LURIA A LIMPIALA A LIA
	MA_PMMA_PM	NA DMMA PM	MA DMIMA DM	MA PMMA PN	MA PMMA PM
PEO	PEO PEO PEO	PEO P PEO	PEO PEO	PEO' 'EC	PEO PEO PEO
	PEC EO	PEC 'O	PEC EO	PEC 'C	PEC PEO EO
				PEC / EC	
	A	6 =	6 . 1	·	
	PEO F. YEO	PEO r_ PEO	PEO r_ PEO	PEO FRO PEC	PEO. PEO
SEBS		S SERS SERS S	SERV VERN N	SEDS SEDS	<b>SEBS SEBS S</b>
	SEP S S	SELS SELS	SF 3S S	SF is is is	S SEF SS S
	SE S SEN I S	SSE'S SSS			
	SEN SE'S S		St JIS S	and the second	
	SEBS SEBS S	S SE SE SS S.	SEBS S	SE	SE SE SS S
	SEDS SEDS 2	S SEBS SEBS S	CEDC CEDC	CEDC CEDC	SERS SERS S

**Fig. S4** PVDF, PMMA, PEO, and SEBS polymer solutions in different organic solvents of cyclohexane, toluene, DME, THF, and ACN. The red-star-marked combinations are the polymer solution candidates for further evaluations.

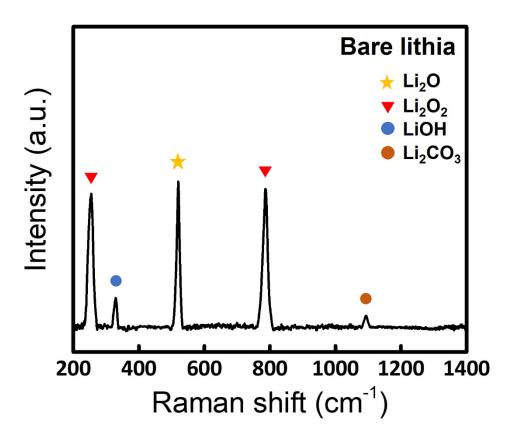
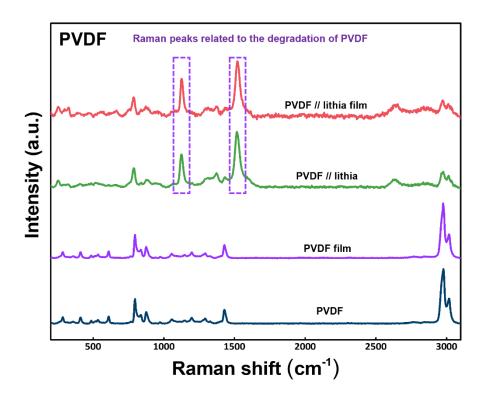


Fig. S5 Raman spectrum of the pristine heat-treated lithia.



**Fig. S6** Raman spectra of PVDF powder, PVDF film prepared with cyclohexane, the powder mixture of PVDF and lithia, and the composite film of PVDF and lithia prepared with cyclohexane.

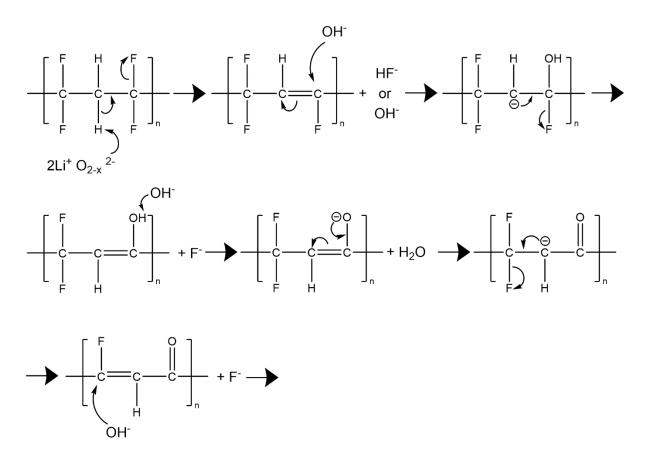


Fig. S7 Possible mechanisms of PVDF degradation.

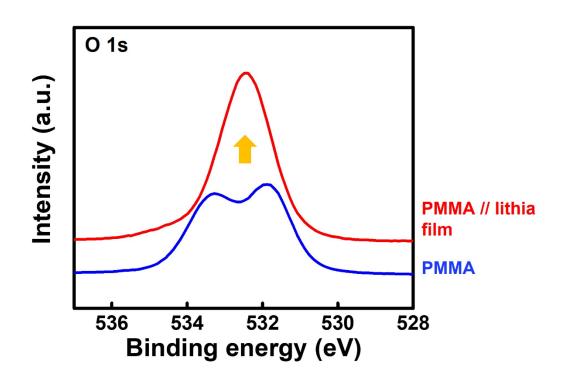
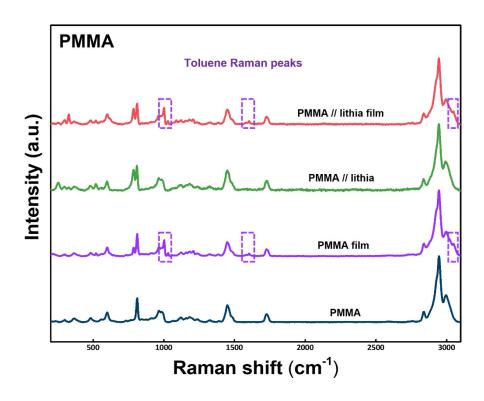


Fig. S8 O1s XPS profiles of PMMA powder (blue) and the composite film of PMMA and lithia prepared with toluene (red).



**Fig. S9** Raman spectra of PMMA powder, PMMA film prepared with toluene, the powder mixture of PMMA and lithia, and the composite film of PMMA and lithia prepared with toluene.

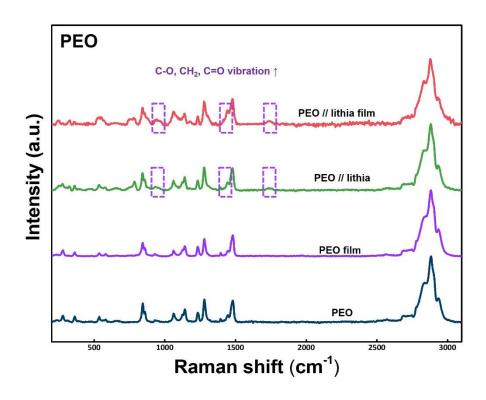


Fig. S10 Raman spectra of PEO powder, PEO film prepared with ACN, the powder mixture of PEO and lithia, and the composite film of PEO and lithia prepared with ACN.

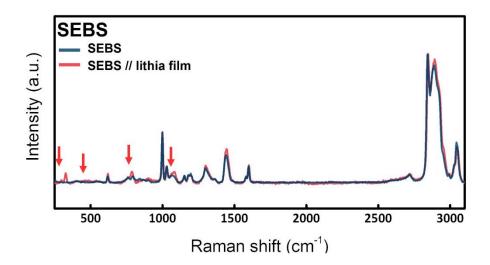
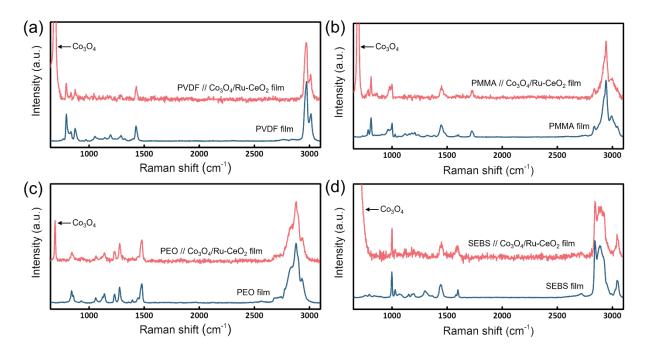
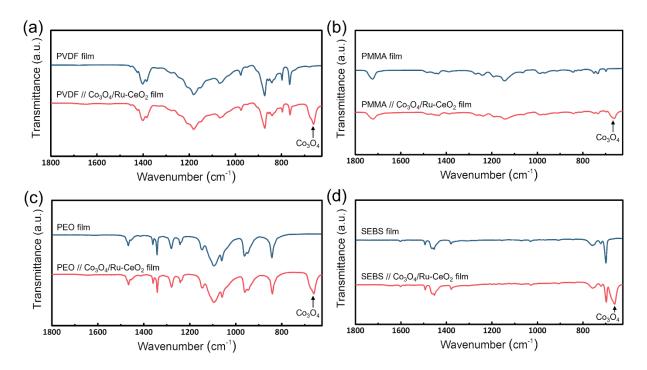


Fig. S11 Raman spectra of SEBS powder (blue) and the composite film of SEBS and lithia prepared with cyclohexane (red). The red arrows indicate the base picks of lithia.



**Fig. S12** Raman spectra of the binder films and composite films of Co<sub>3</sub>O<sub>4</sub>/Ru-CeO<sub>2</sub> prepared with (a) PVDF– cyclohexane, (b) PMMA–toluene, (c) PEO–ACN, and (d) SEBS–cyclohexane binders.



**Fig. S13** FT-IR spectra of the binder films and composite films of Co<sub>3</sub>O<sub>4</sub>/Ru-CeO<sub>2</sub> prepared with (a) PVDF– cyclohexane, (b) PMMA–toluene, (c) PEO–ACN, and (d) SEBS–cyclohexane binders.