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## **Supporting Information**



**Figure S1.** FESEM images of LTO electrodes of (a)-(c) fresh batteries (d)-(f) cycled batteries; internal SEM images by FIB cutting of LTO electrodes of (g,h) fresh batteries and (i,j) cycled batteries.



**Figure S2.** FESEM images of NCM electrodes of batteries cycled at (a)-(c) 25 °C (d)-(f) 35 °C; internal SEM images by FIB cutting of NCM electrodes of batteries cycled at (g)-(i) 25 °C (j)-(l) 35 °C.



Figure S3. FESEM images of the two sides of separators of fresh batteries (a-c, g-i) and cycled batteries (d-f, j-I).

(a)	(1)	(6)	
(b) C Ka1,2	(g) C Ka1,2	(I) C Ka1,2	(q) C Ka1,2
2.5 μm	<u>5 µm</u>	<u>2.5 μm</u>	2.5 μm
(c) O Ka1	(h) O Ka1	(m) O Ka1	(r) O Ka1
<u>2.5 µm</u>	<mark>- 5 µт</mark> .	<u>2.5 μm</u>	<u>2.5 μm</u>
(d) F Ka1,2	(i) F Ka1.2	(n) F Ka1,2	(s) F Ka1.2
<u>2.5 µm</u>	_5 µm	<u>. 2.5 µm</u>	<u>2.5 μm</u>
(e) Al Ka1	(j) Al Ka1	(o) Al Ka1	(t) Al Ka1
<u>2.5 µт</u>	<u>5.µm</u>	<u>2.5 µm</u>	<b>2.5 μm</b>

Figure S4. Images by EDS of the distribution of elements on two sides (PP: a-j, Al<sub>2</sub>O<sub>3</sub>: k-t) of separators of fresh batteries (a-e, k-o) and cycled batteries (f-j, p-t).

	Table S1. Ratios of elements (	from XPS) o	on PP and Al <sub>2</sub> O <sub>3</sub>	surfaces of di	ifferent sample se	eparators.
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Elen	nents	С	0	F	Al	Li
PP (At%)	Fresh	92.04	4.12	0.87	0.40	2.57
	Cycled	75.09	16.05	4.37	0.52	3.97
Al <sub>2</sub> O <sub>3</sub> (At%)	Fresh	26.94	40.60	7.63	19.30	5.53
	Cycled	18.82	29.39	22.54	11.29	17.96