

Supporting Information

High-Performance SiO Electrode for Lithium-ion Batteries: Merged Effect of New Polyacrylate Binder and Electrode- Maturation Process

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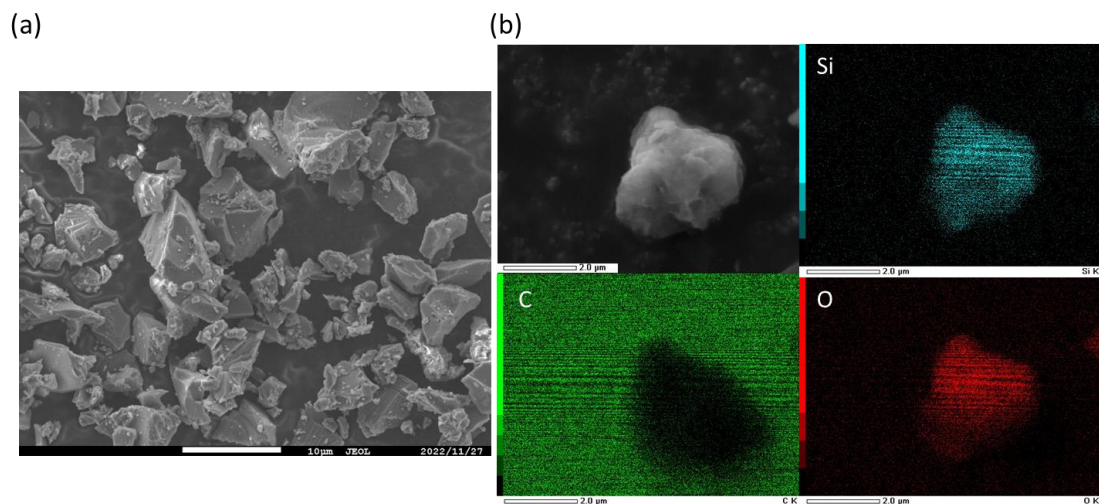


Figure S1. (a) SEM image of SiO@C particles and (b) corresponding EDS elemental mappings of Si, C, and O.

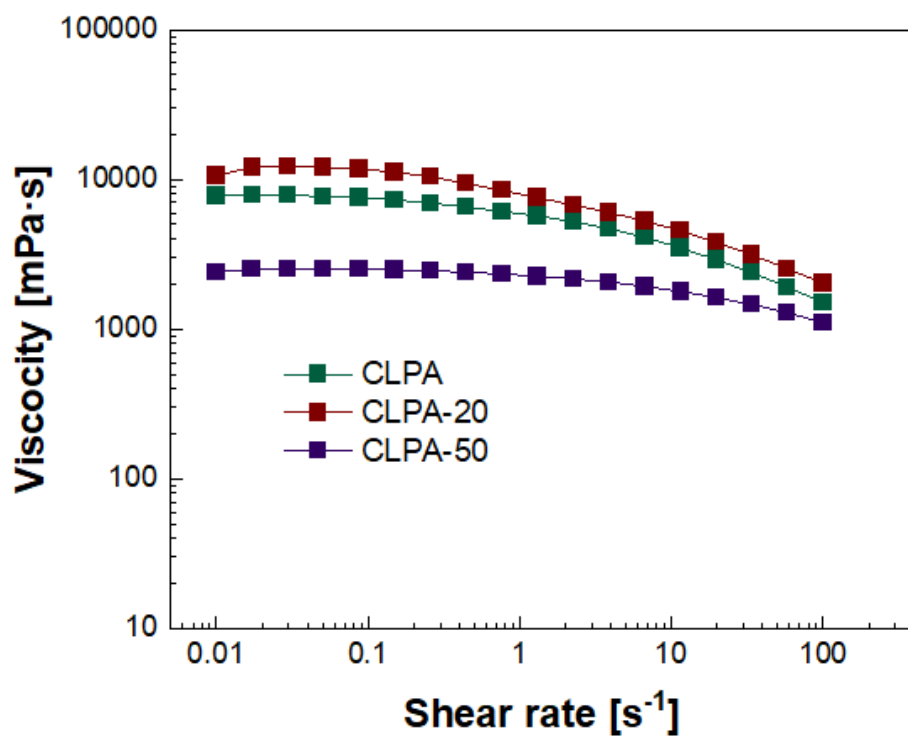


Figure S2. Viscosity flow curve of 10 wt % solution of CLPA, CLPA-20, and CLPA-50 binder.

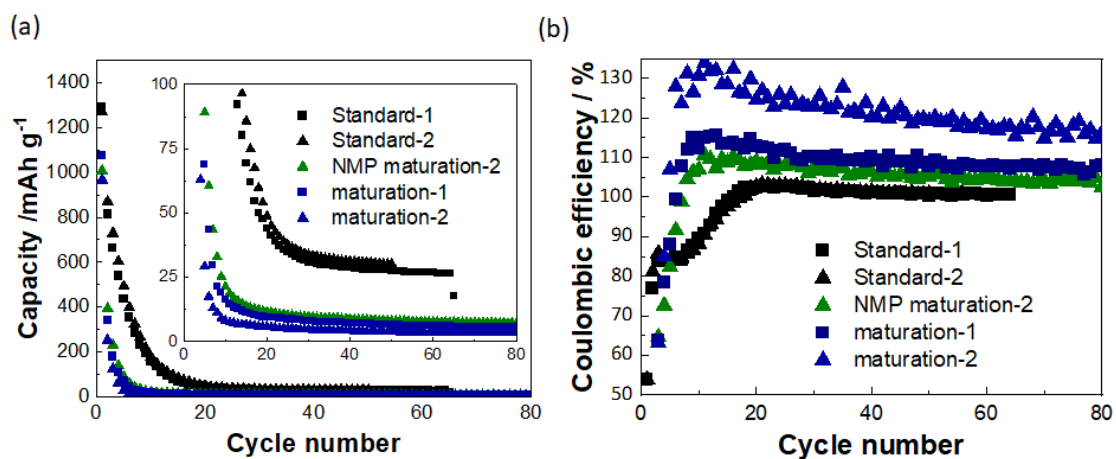


Figure S3. Cycling performance: (a) discharge capacity and (b) Coulombic efficiency of SiO@C/Li half-cells fabricated using SiO@C composite electrode with PVDF binder. The electrodes were matured for three days at 90% RH or saturated NMP-vapor.

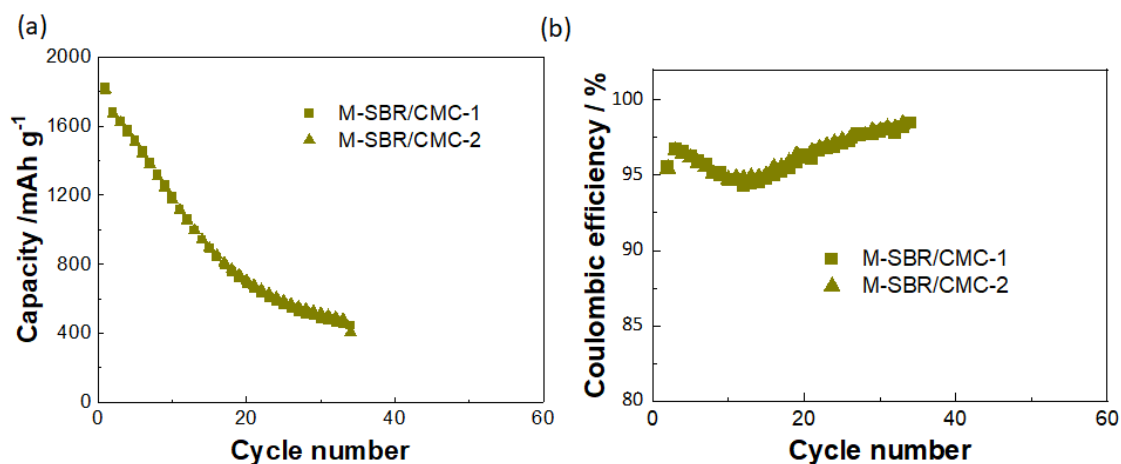


Figure S4. Cycling performance: (a) discharge capacity and (b) Coulombic efficiency of SiO@C/Li half-cells fabricated using SiO@C composite electrode with SBR/CMC binder. The electrodes were matured for three days at 90% RH.

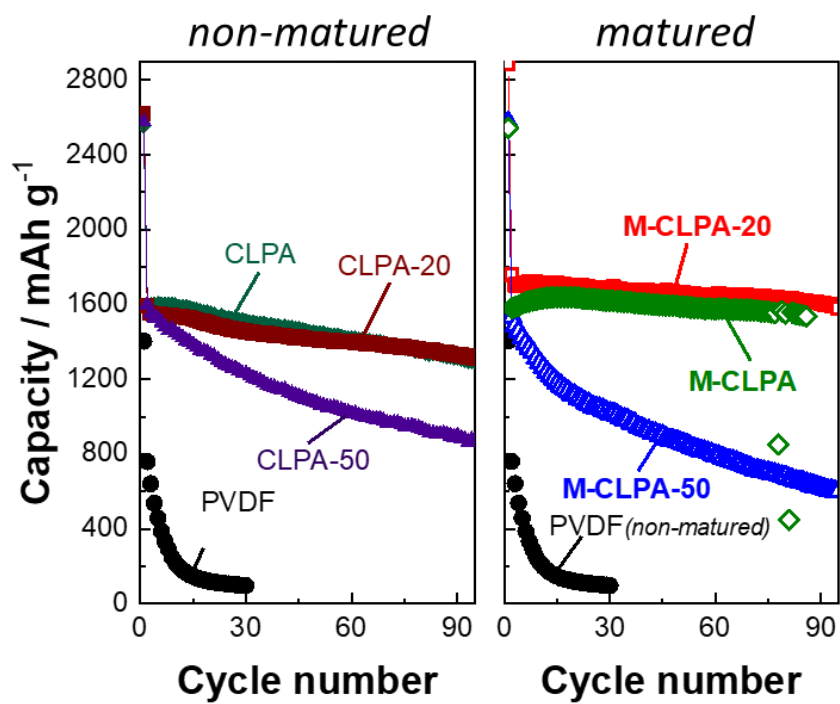


Figure S5. Cycling performance: variations in charge capacity of matured and non-matured SiO@C composite electrodes with PVDF and CLPA-based binders in Li half-cells.

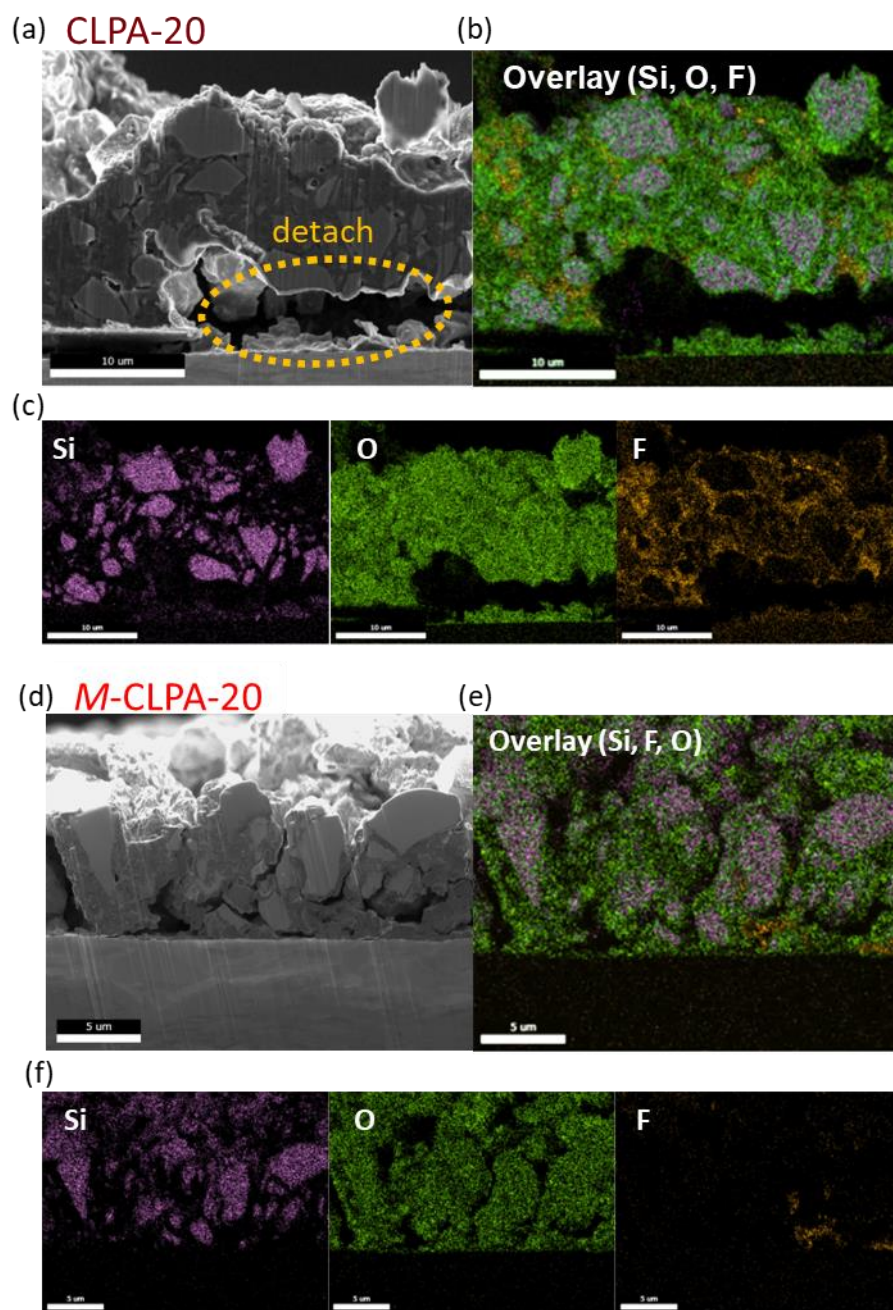


Figure S6. Cross-sectional SEM images of (a) non-matured SiO@C composite electrode with CLPA-20 and (b) corresponding EDS elemental mapping overlaid with of Si, Na, and O, and (c) elemental maps of Si, O, Na, and C, and (d) SiO@C composite electrodes with M-CLPA-20 after cycling and (e) corresponding EDS elemental mapping overlaid with of Si, Na, and O, and (f) elemental maps of Si, O, Na, and C.

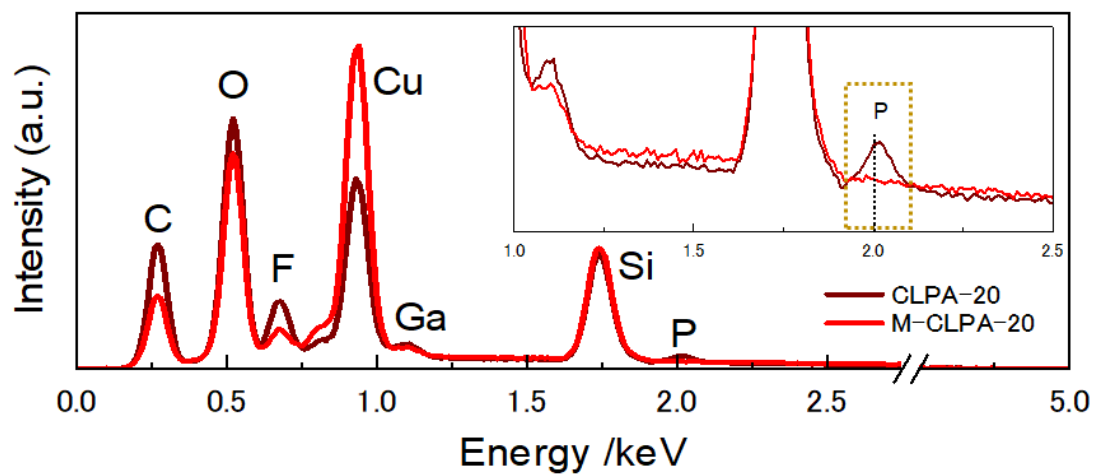


Figure S7. SEM-EDS profiles of non-matured and matured SiO@C composite electrodes with CLPA-20.

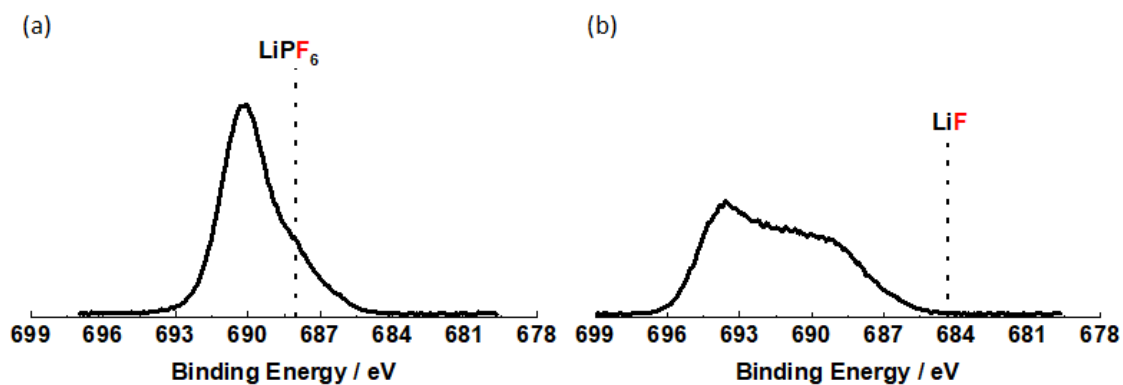


Figure S8. HAXPES spectra of F 1s: (a) LiF and (b) LiPF₆. The samples composed of LiF or LiPF₆: AB: PVA = 80: 10: 0.5 (weight ratio) were prepared in an Ar atmosphere.

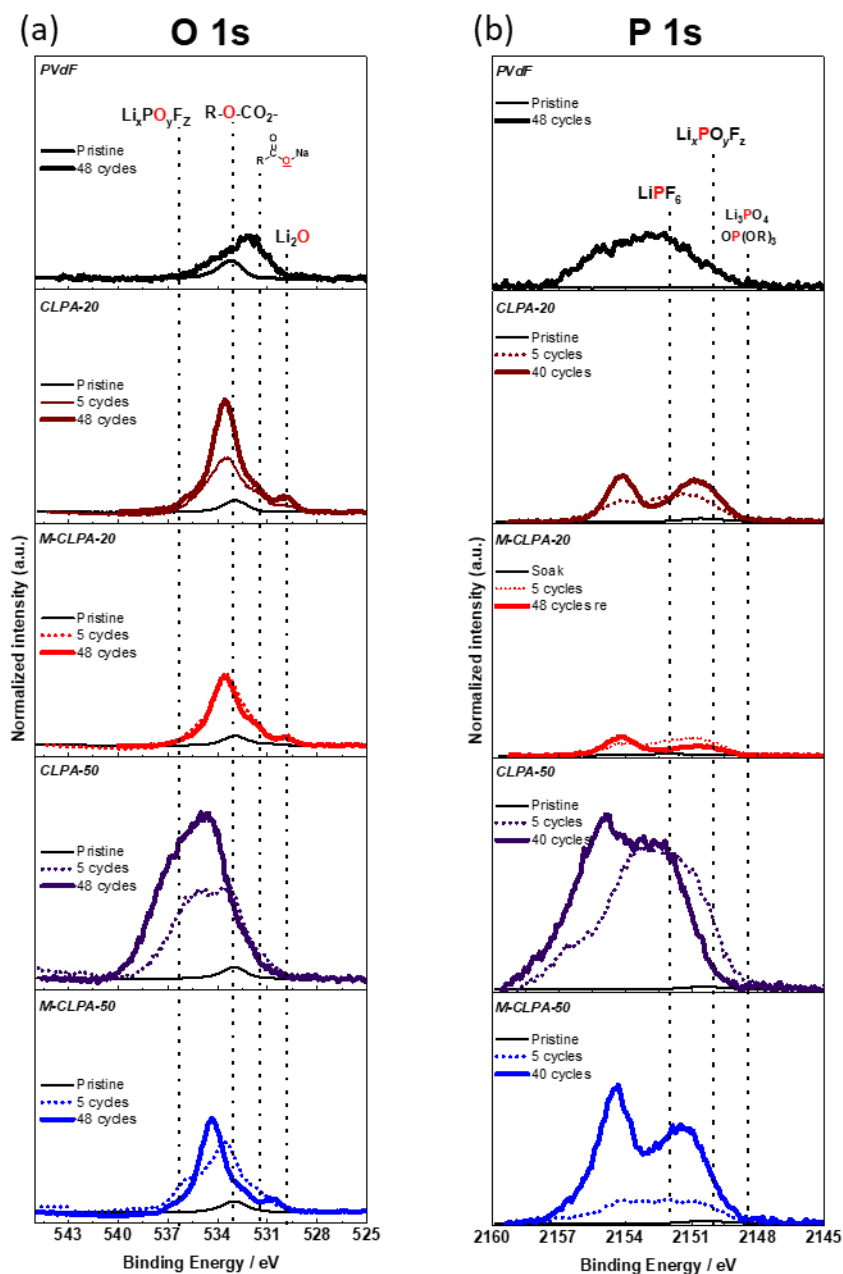


Figure S9. (a) O 1s and (b) P 1s HAXPES spectra of the non-matured and matured SiO@C composite electrodes with different binders before cycling, after 5 cycles, and after 48 cycles.

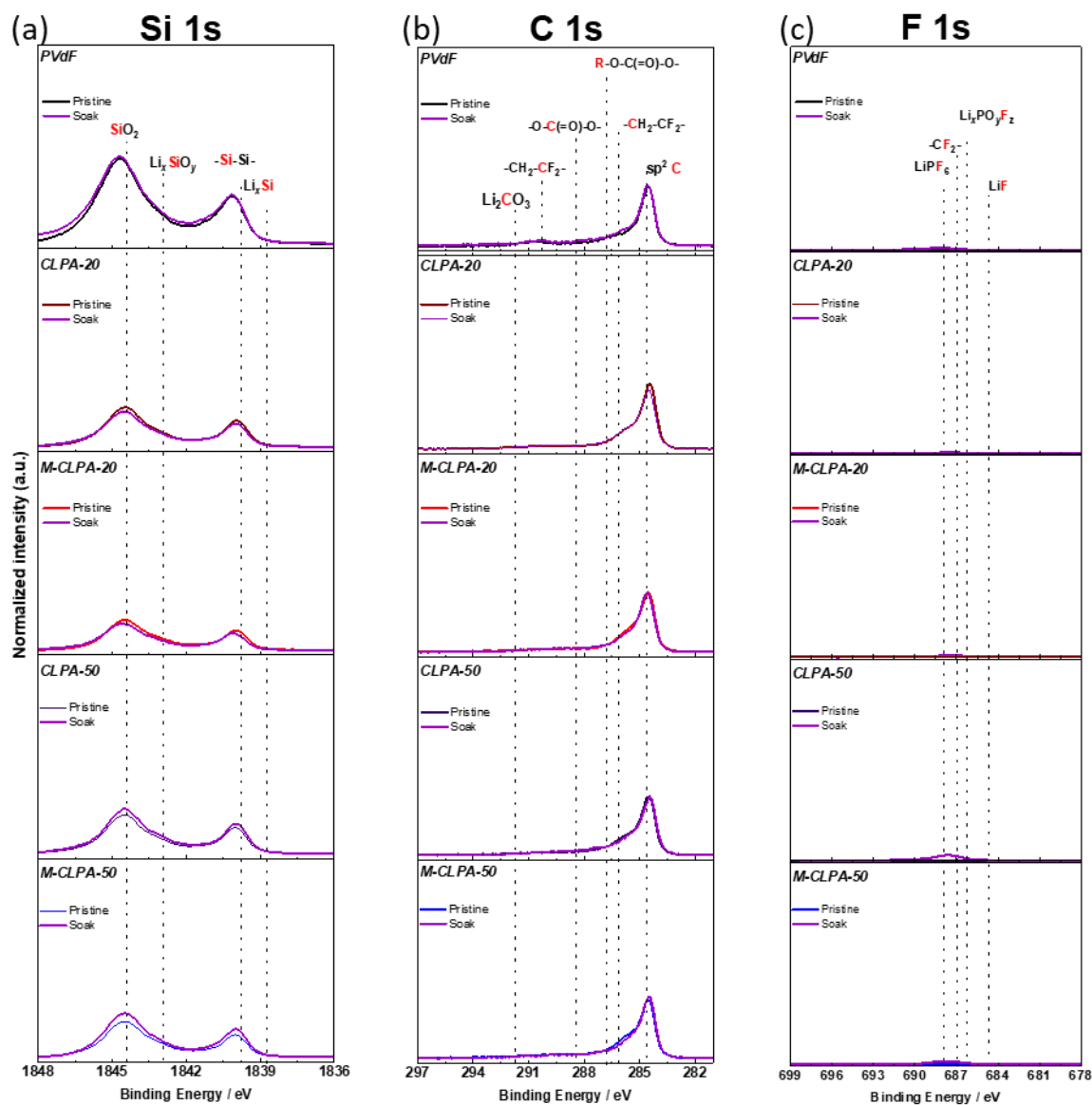


Figure S10. (a) Si 1s, (b) C 1s, and (c) F 1s HAXPES spectra of pristine and electrolyte (1 M LiPF_6 in EC/DMC with 2 vol % FEC) soaked non-matured and matured $\text{SiO}@C$ composite electrodes with different binders.

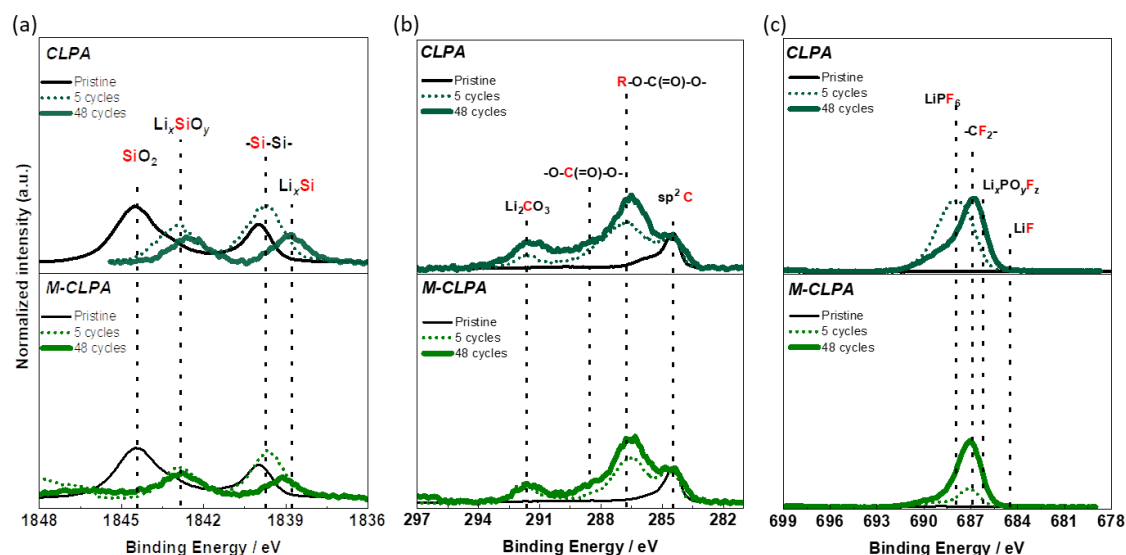


Figure S11. (a) Si 1s, (b) C 1s, and (c) F 1s HAXPES spectra of the non-matured and matured SiO@C composite electrodes with CLPA binder before cycling, after 5 cycles, and after 48 cycles.

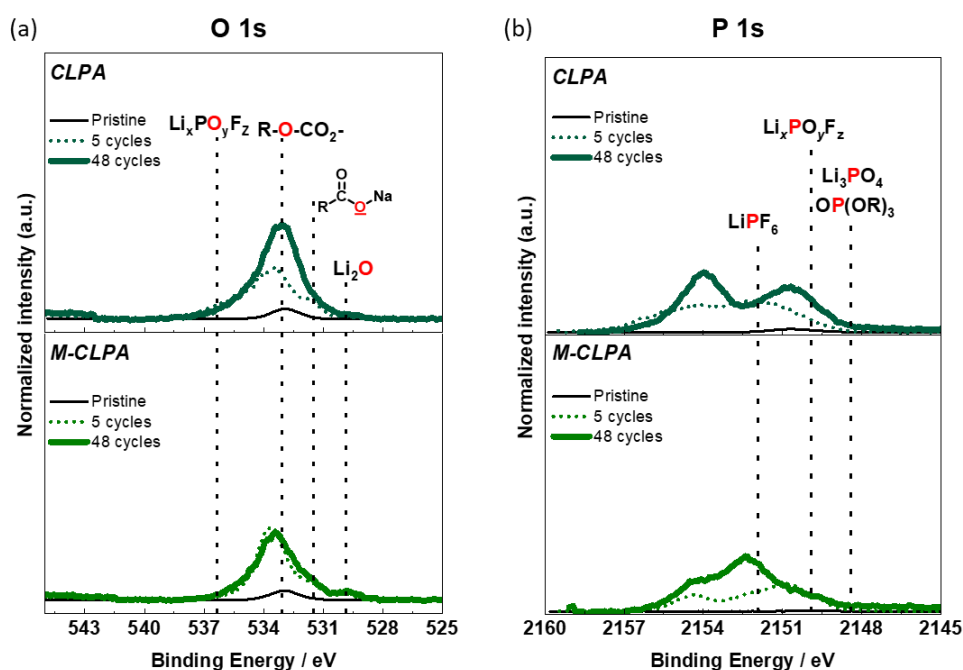


Figure S12. (a) O 1s and (b) P 1s HAXPES spectra of the non-matured and matured SiO@C composite electrodes with CLPA binder before cycling, after 5 cycles, and after 48 cycles.

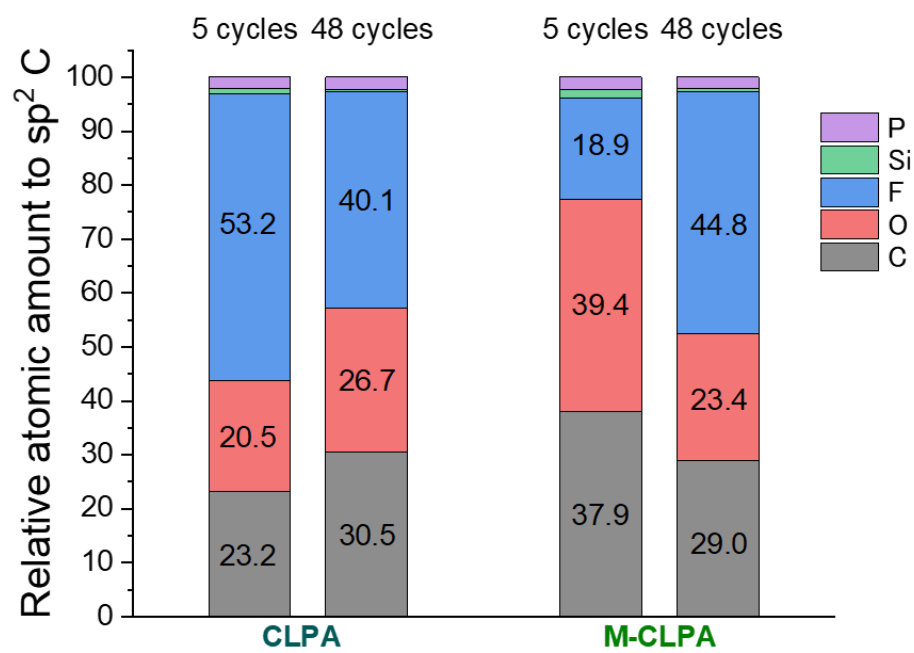


Figure S13. The atomic ratio of elements relative to sp^2 carbon of non-matured and matured SiO@C composite electrode surfaces with CLPA.

Table S1. Comparison of electrochemical performance of SiO electrodes with each binder.

Binder	Capacity (mAh g ⁻¹)	Capacity retention (%)	Cycles	Current (A g ⁻¹)	Ref
PAA	700	84.7	50	0.1	[1]
PAA + sorbitol	696	71	500	0.5	[2]
Sodium alginate	923.5	83.7	50	1 st to 9 th : 0.1 10 th ~: 0.3	[3]
PAA + poly glutamic acid	1387.2	87.3	100	1 st : 0.08 2 nd ~: 0.16	[4]
Polyacrylamide + poly(tetrafluoroethylene) + styrene butadiene rubber	770	60	300	0.5	[5]
Poly (acrylamide + acrylic acid)	734	57.7	300	1 st to 3 rd : 0.1 4 th ~:0.5	[6]
Poly (9,9- dioctylfluorene-co- fluorenone-co-methyl benzoic ester)	1186	106.9	100	0.1	[7]
CLPA-20	1322	87.3	90	1 st : 0.025 2 nd ~:0.1	This work
M-CLPA-20	1598	96.5	90	1 st : 0.025 2 nd ~:0.1	This work

References

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