

Scavenging Multifunction in MOF-Al₂O₃-based Janus separator for high-voltage Lithium batteries

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Supplemental Information

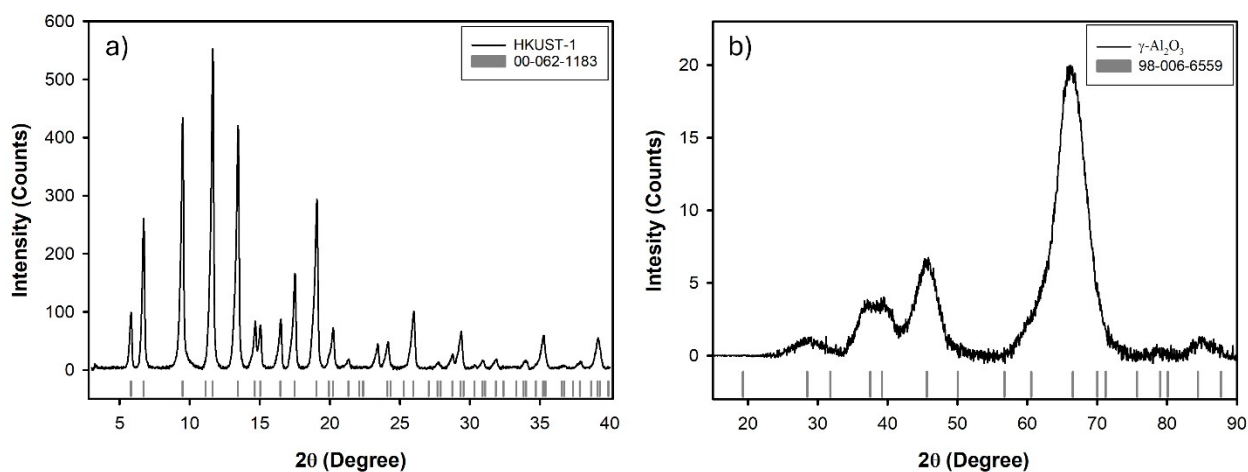


Figure S1. XRD pattern of a) HKUST-1 and b) Alumina nanoparticles.

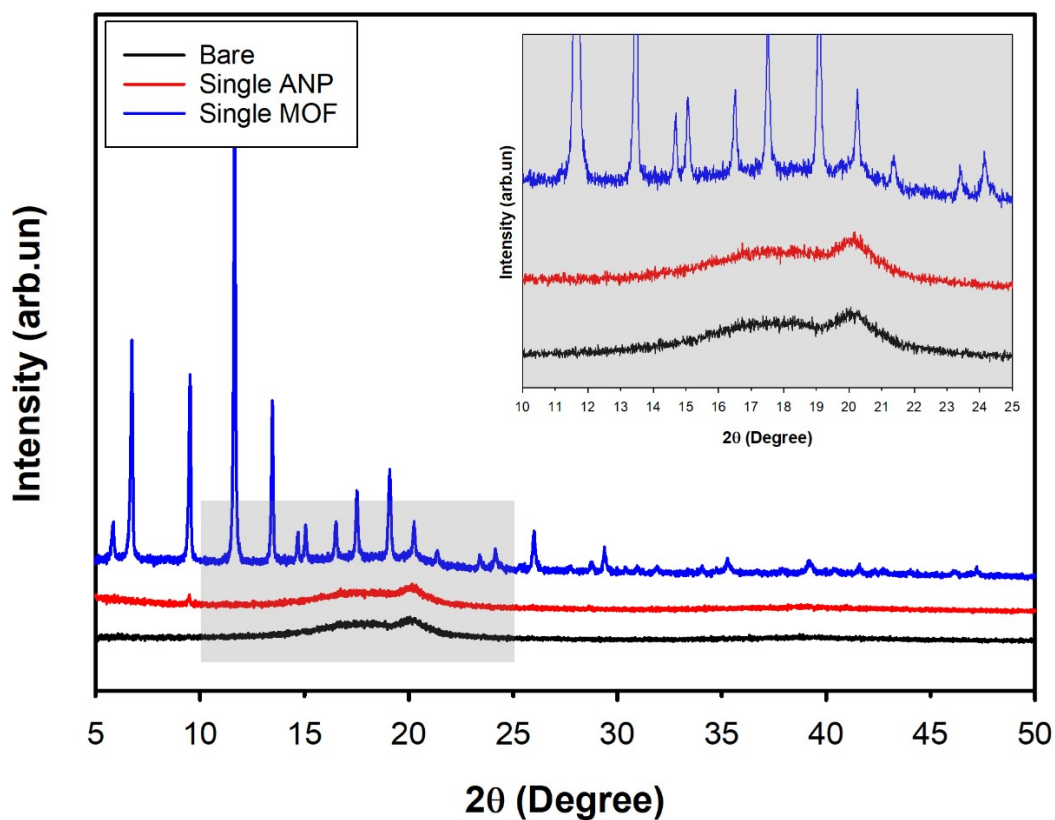


Figure S2. XRD pattern of Bare (black line), Single ANP (red line) and Single MOF (blue line) separator.

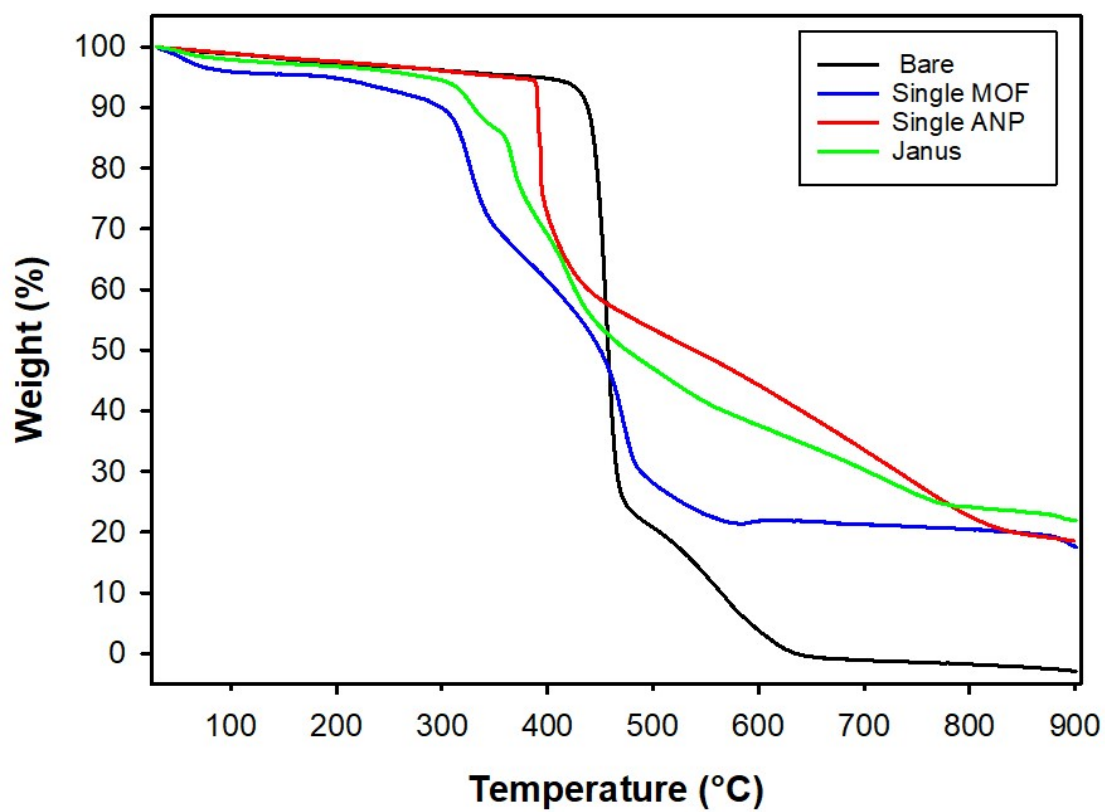


Figure S3. TGA curves of the investigated separators.

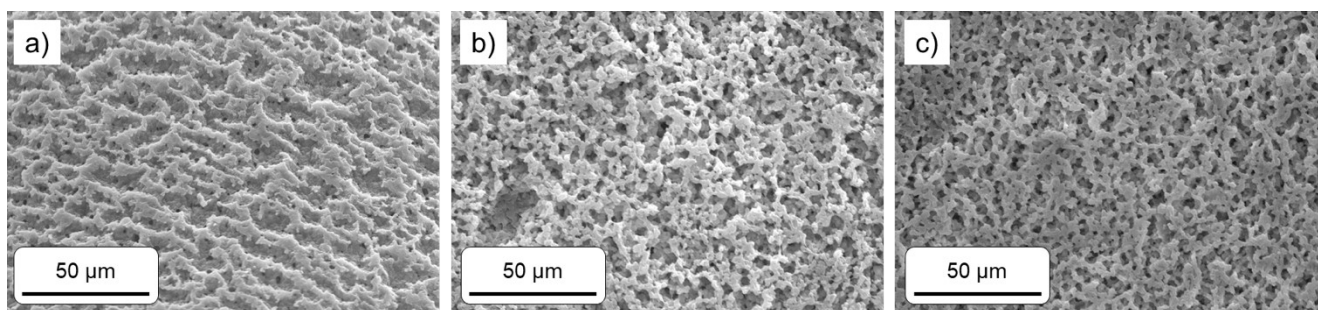


Figure S4. Top-view SEM images of a) Bare PVDF-HFP, b) Single MOF and c) Single ANP separators.

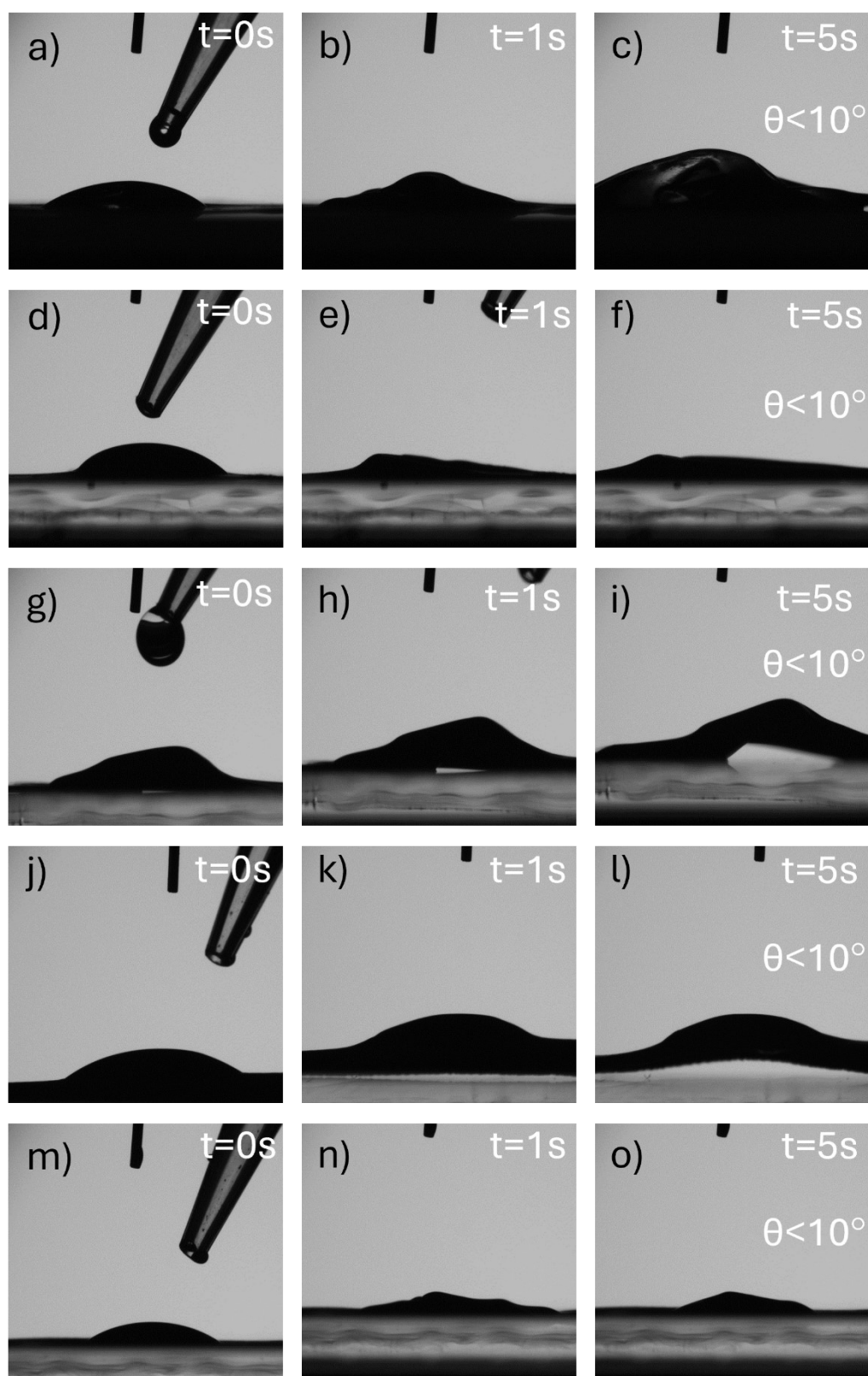


Figure S5. Contact angle test with LP30 electrolyte at different times of a-c) Bare separator, d-f) Single ANP separator, g-i) Single MOF separator, j-l) MOF layer of Janus separator and m-o) ANP layer of Janus Separator. All the tests recorded a contact angle $< 10^\circ$

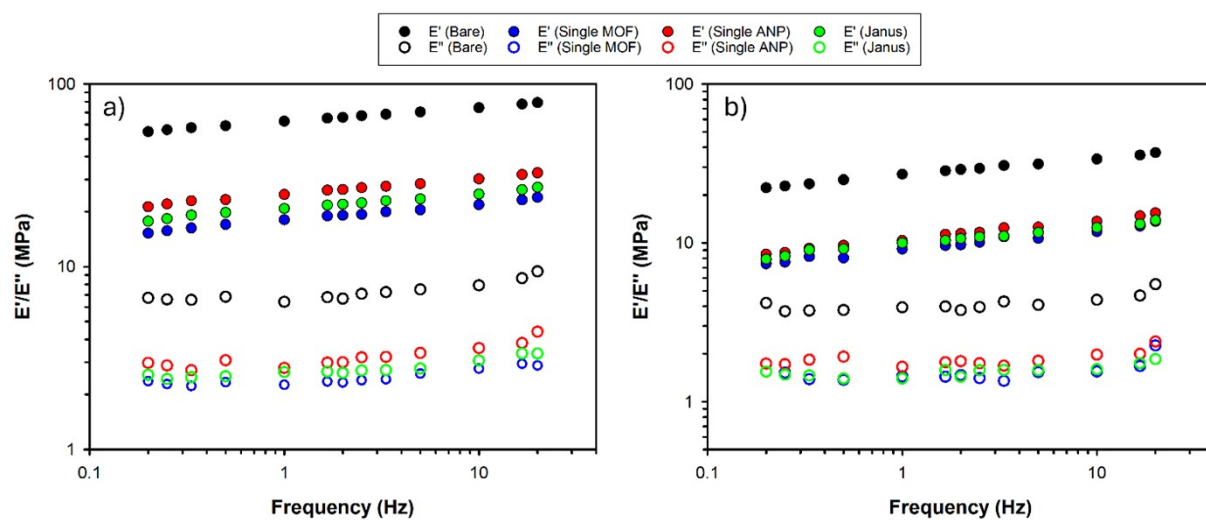


Figure S6. Frequency-sweep plots of the investigated separators a) at 50°C and b) 70°C.

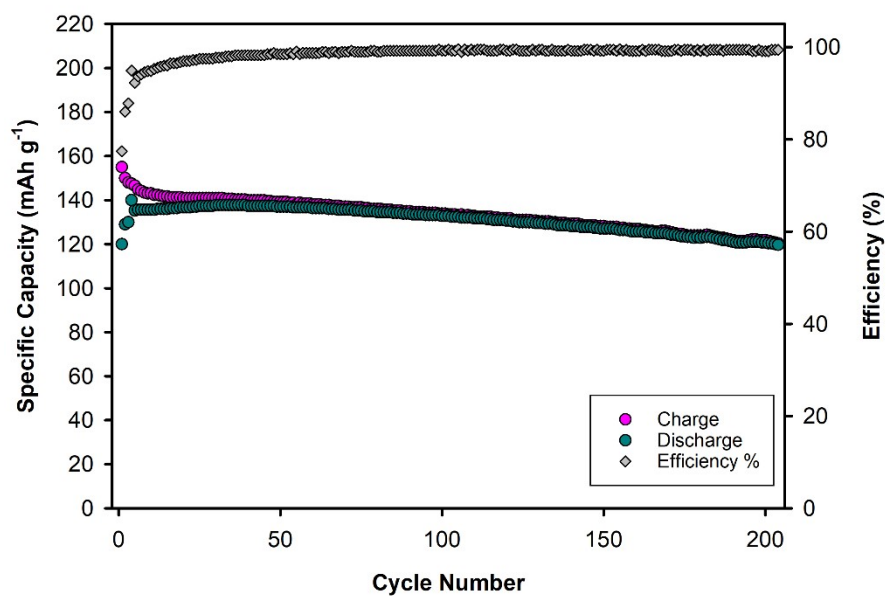


Figure S7. Charge and discharge capacity at 1C of galvanostatically cycled LNMO|Li coin cell with Janus separator with anhydrous electrolyte

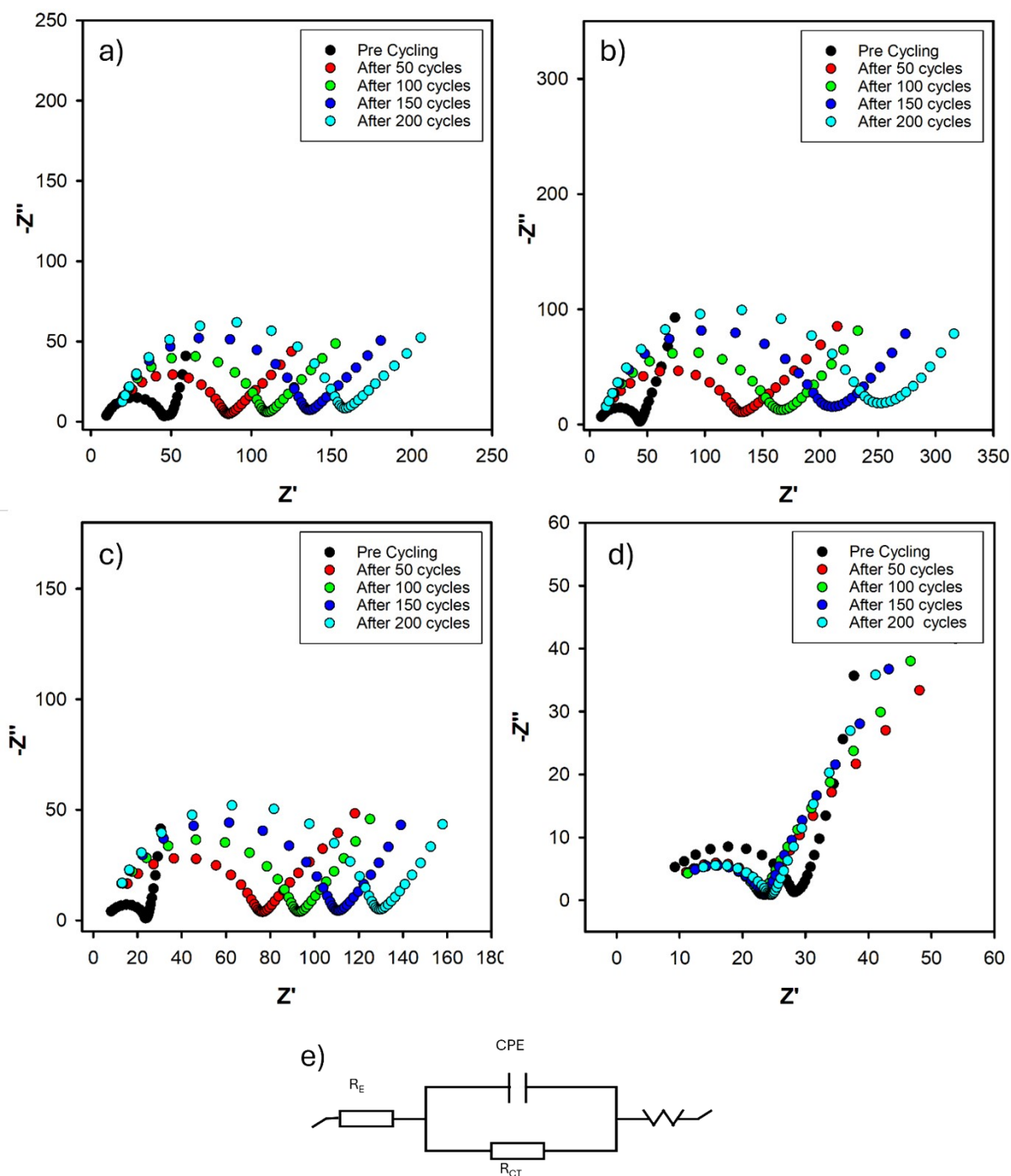


Figure S8. Nyquist plots of the LNMO|Li cells during the GCPL analysis with water enriched electrolyte with a) Bare, b) Single MOF, c) Single ANP, d) Janus separators. e) Schematic representation of the equivalent circuit used to fit the impedance spectra.

Samples	Spinel $a/\text{\AA}$	Unit cell volume/ \AA^3
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OCV	8.166(1)	544.5(2)
Bare	8.157(4)	542.7(8)
Single MOF	8.163(1)	543.9(2)
Single ANP	8.167(2)	544.7(4)
Janus	8.164(2)	544.1(4)

Table S1: Cell parameters computed for LNMO cathodes before and after 200 cycles at 1C with water-enriched electrolyte.