

Supporting information for

Highly Graphitic Carbon Coating on  
 $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$  Derived from Precursor with  
Perylene Core for High-power Battery Applications

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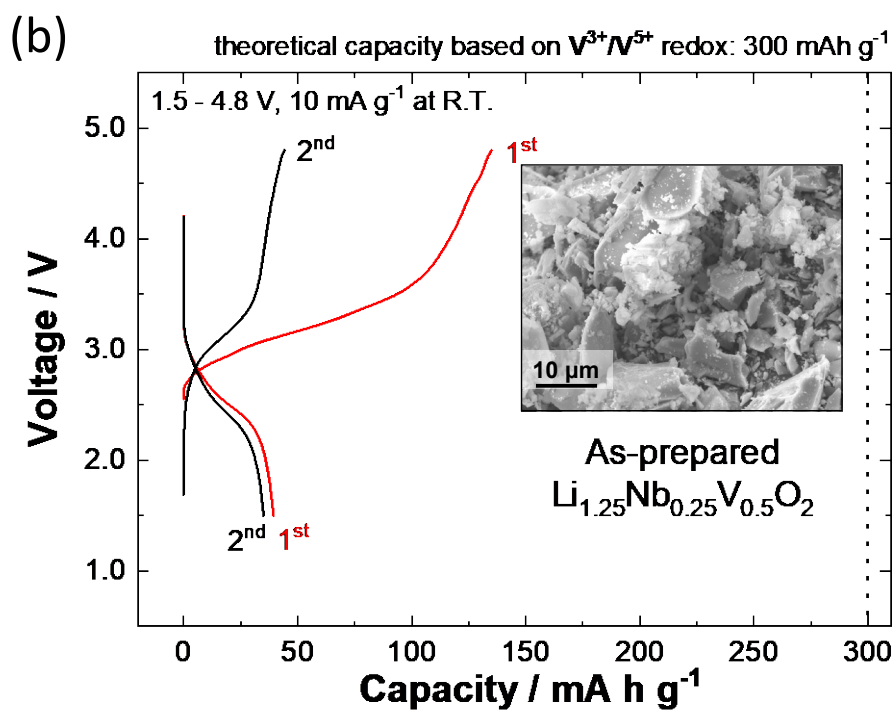
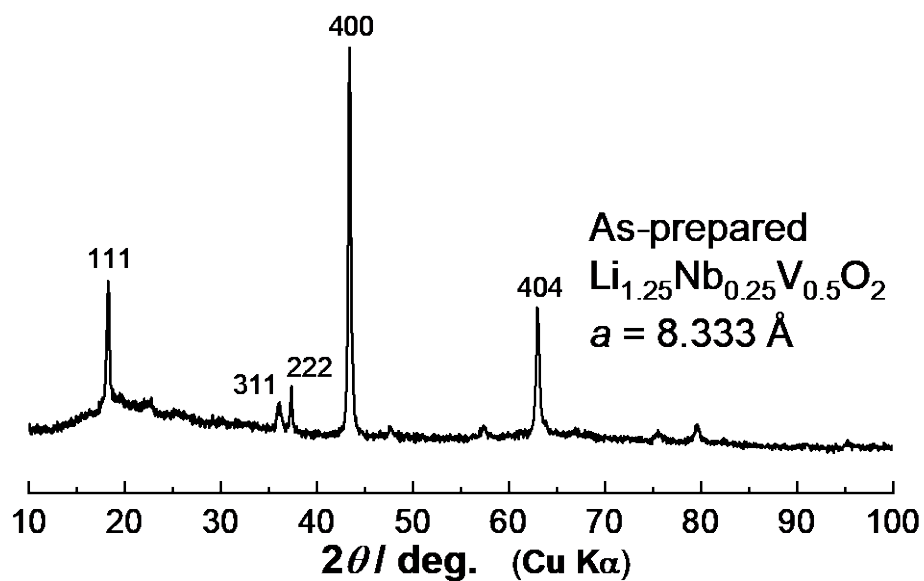
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## Supporting Figures and Table

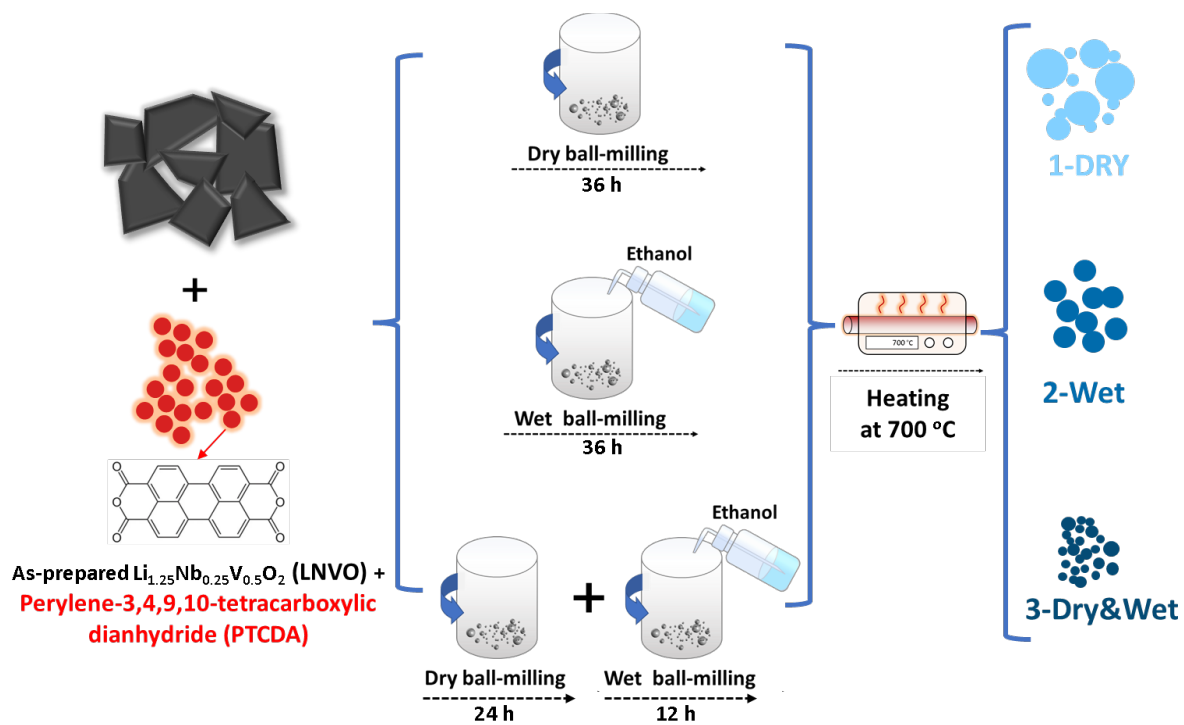
**Table S1.** Crystallographic parameters obtained by Rietveld analysis on the synchrotron diffraction pattern of 3-Dry&Wet sample. The ratio of  $c/a$  axis parameters nearly equals 4.9, which is identical to the cubic phase as shown in **Figure 2a**. Partial cation ordering similar to  $\alpha$ -NaFeO<sub>2</sub>-type layered structure is noted, but non-negligible cation mixing is also evidenced.

Atom	Site	$x$	$y$	$z$	Occupancy	$B^\dagger/\text{\AA}^2$
Li 1	3a	0	0	0	0.52(1)	0.5
V 1	3a	0	0	0	0.32(1)	0.5
Nb 1	3a	0	0	0	0.16(1)	0.5
Li 2	3b	0	0	0.5	0.73(1)	0.7
V 2	3b	0	0	0.5	0.18(1)	0.7
Nb 2	3b	0	0	0.5	0.09(1)	0.7
O	6c	0	0	0.246(1)	1.0	0.8

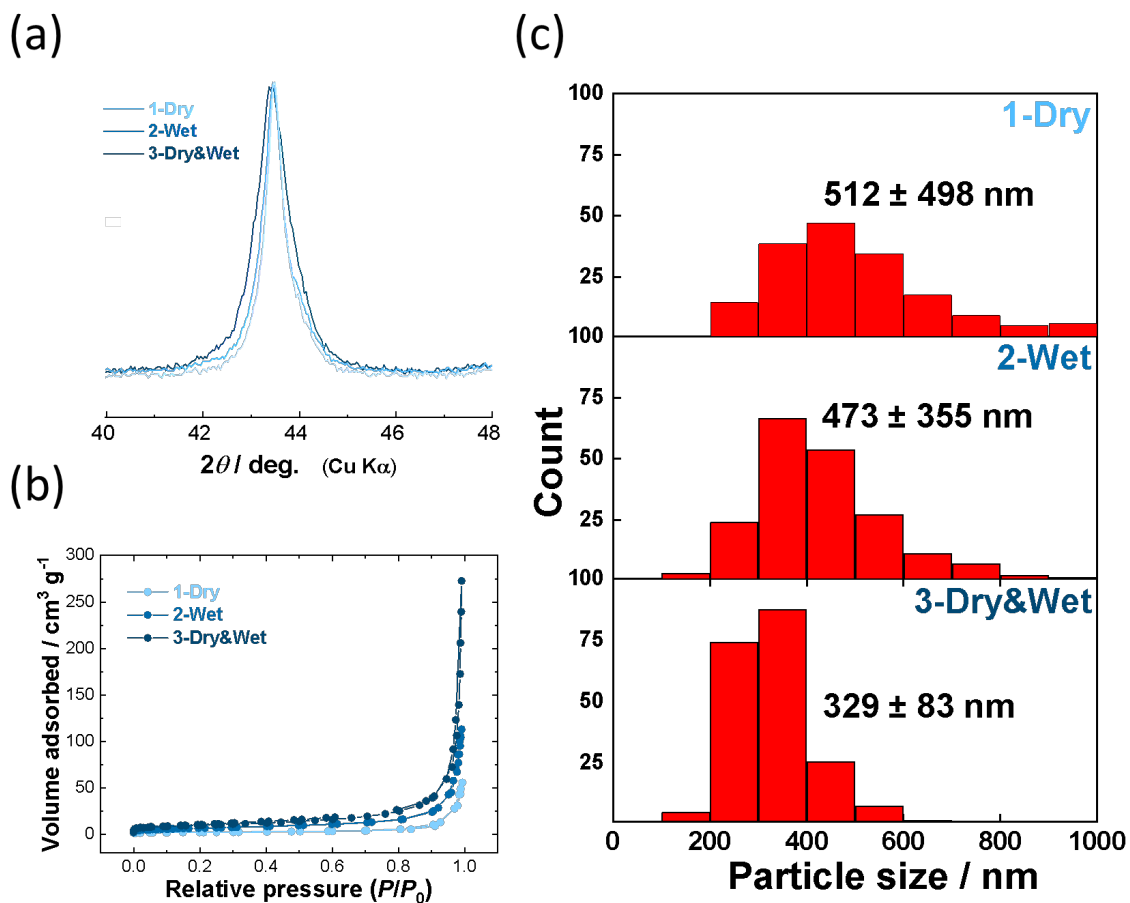
Space group,  $R\bar{3}m$ ,  $a = b = 2.946(1)$  Å,  $c = 14.532(2)$  Å, and  $V = 109.24$  Å<sup>3</sup>,  $R_{wp} = 1.3\%$ , cation mixing 27%. †Not refined



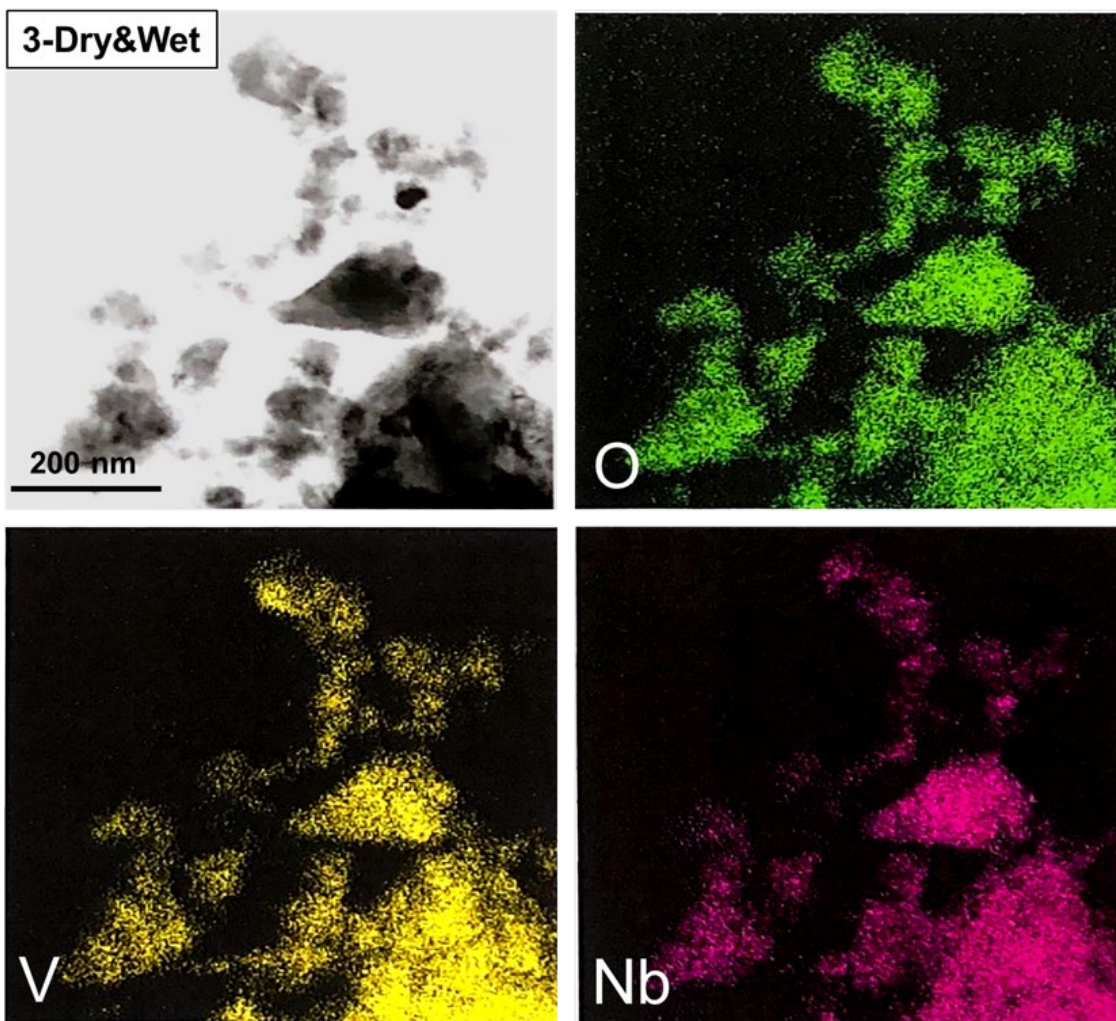
**Figure S1.** As-prepared  $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$ ; (a) an XRD pattern and (b) electrochemical performance as a positive electrode material in LIBs with SEM image.



**Figure S2.** A schematic illustration of the synthesis procedure of nanostructured and carbon coated  $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$  prepared by different conditions.



**Figure S3.** (a) Enlarged XRD profiles, (b) BET specific surface area measurement, and (c) particle size distributions of  $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$  with different particle sizes.



**Figure S4.** TEM and EDX measurement of nanostructured and carbon coated  $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$  (3-Dry&Wet sample).

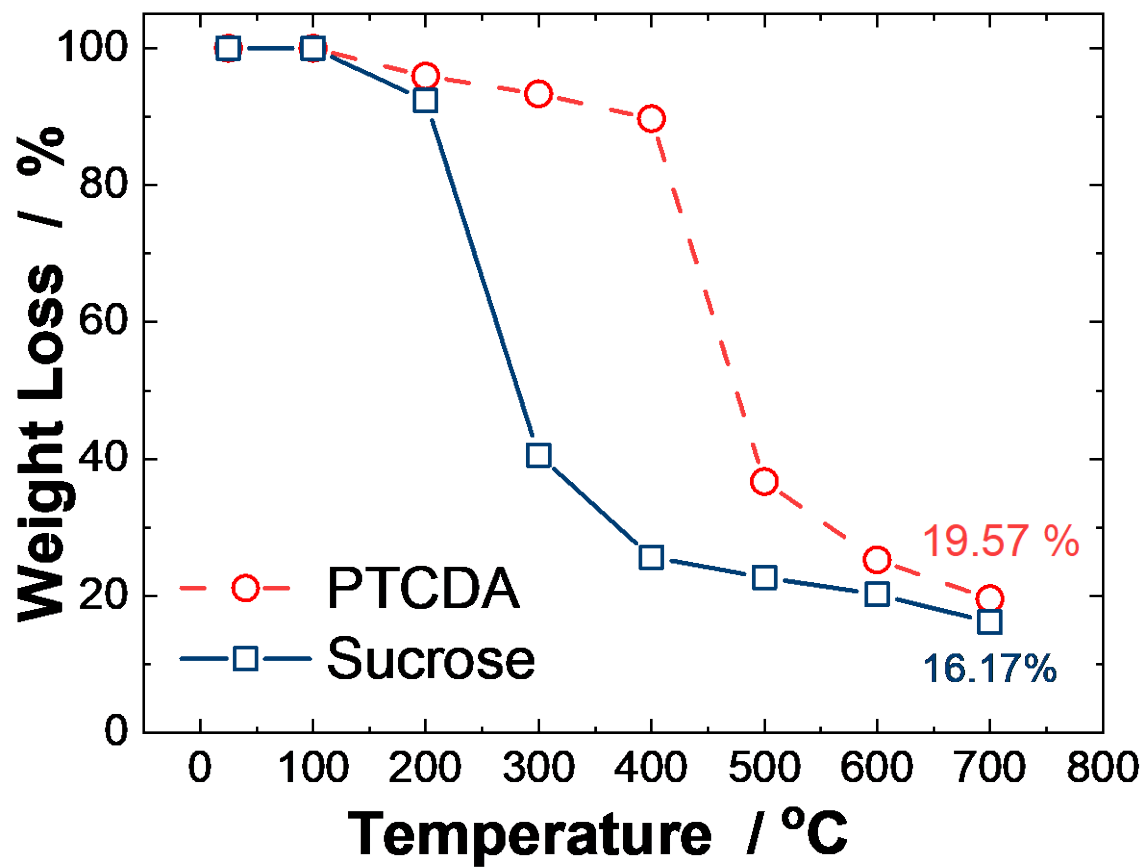
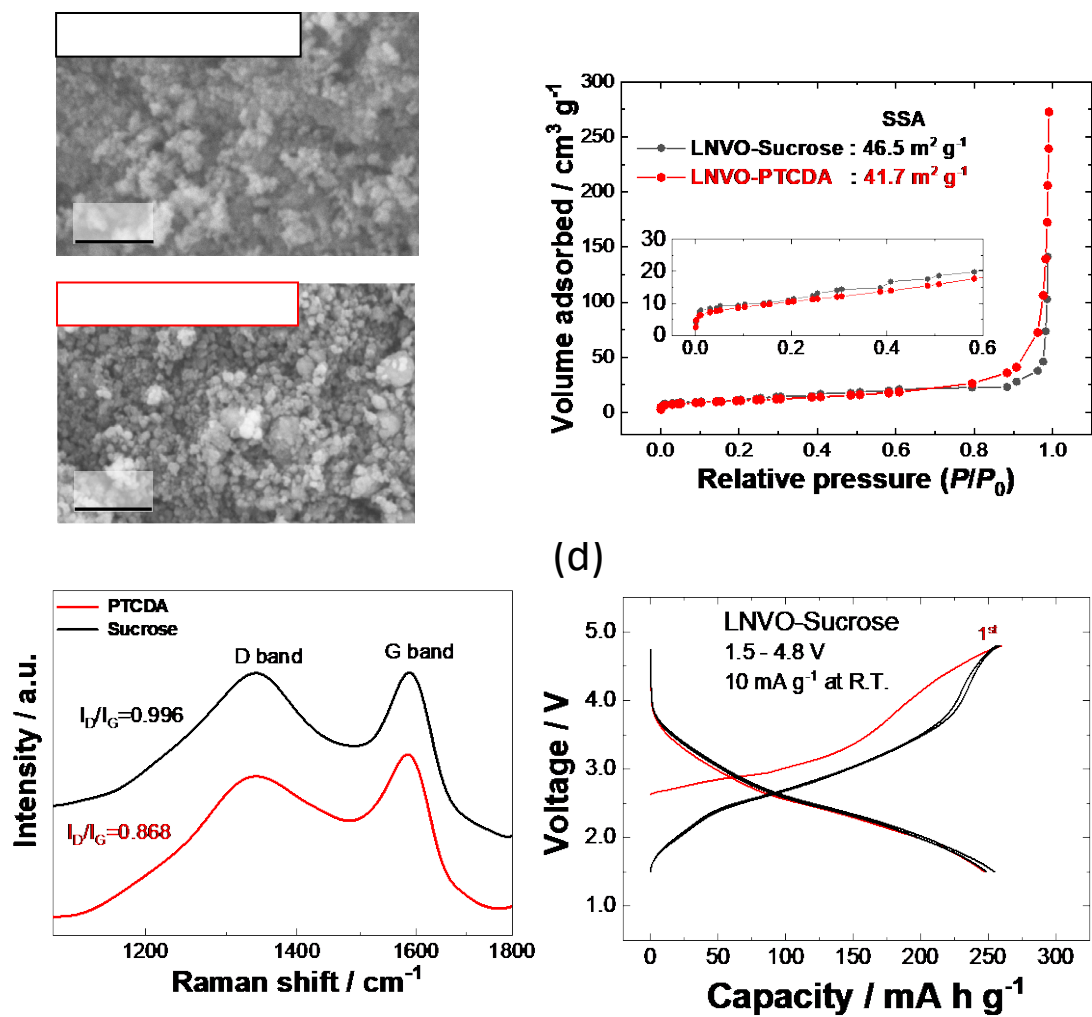
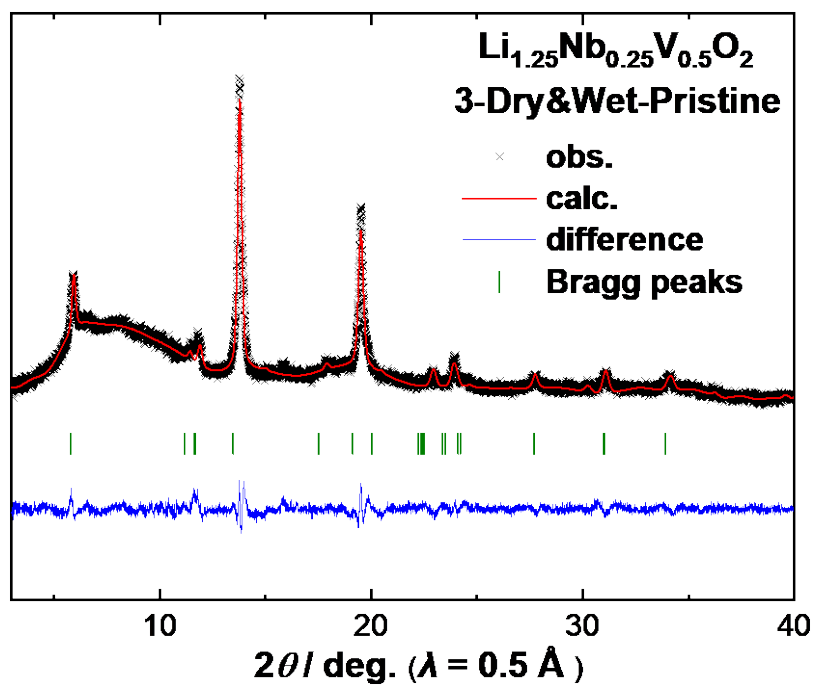


Figure S5. Thermal gravimetric curves of carbon sources in argon atmosphere: sucrose and PTCDA.

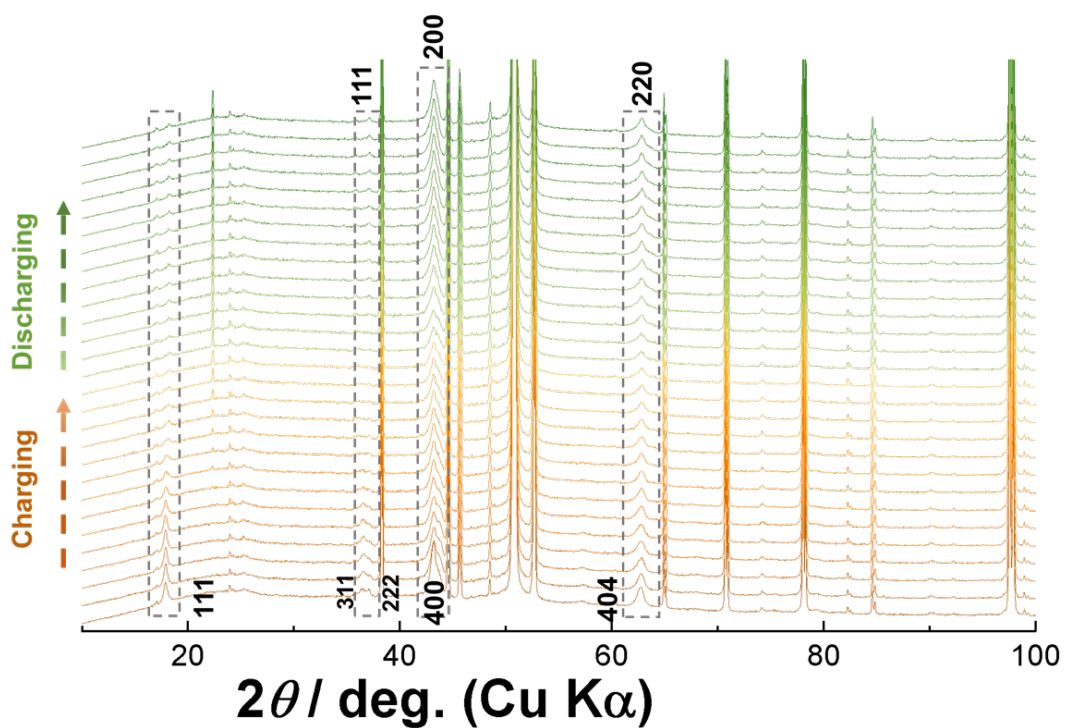


**Figure S6.** LNVO samples (3-Dry&Wet sample) prepared from different carbon sources, sucrose and PTCDA; (a) SEM images, (b) BET specific surface area measurement, (c) Raman spectra, and (d) galvanostatic charge/discharge curve of LNVO-Sucrose at  $10 \text{ mA g}^{-1}$ .

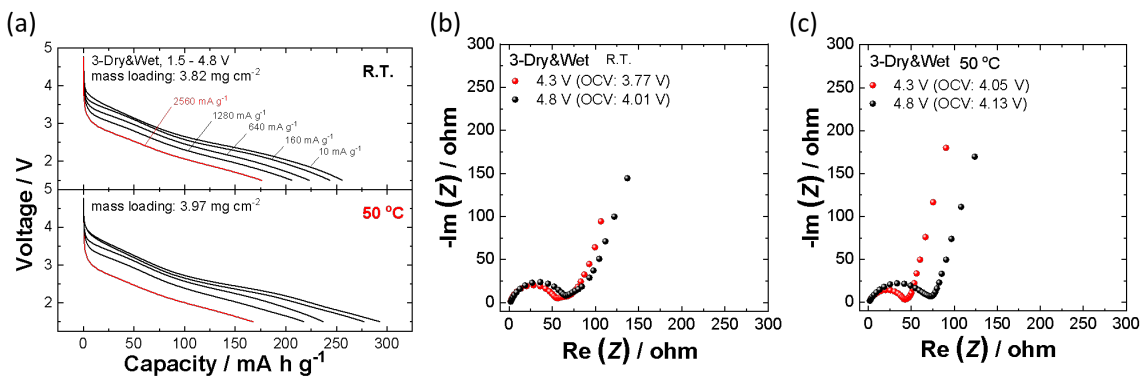




**Figure S7.** Results of Rietveld analysis on as-prepared  $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$ .



**Figure S8.** *In-situ* XRD patterns of  $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$  (3-Dry&Wet sample) on electrochemical cycles.



**Figure S9.** Electrochemical performances of  $\text{Li}_{1.25}\text{Nb}_{0.25}\text{V}_{0.5}\text{O}_2$  at elevated temperature: (a) discharge rate capability with 4.8 V the cut-off voltage. The cells were charged at  $100 \text{ mA g}^{-1}$  to 4.8 V and then held at 4.8 V for 1 hour. EIS spectra of LNVO on charge to 4.3 V and 4.8 V at (b) R.T. and (c) at  $50 \text{ }^\circ\text{C}$ .