

Supporting Information

Co-sputtering of lithium vanadium oxide thin films with variable lithium content to enable advanced solid-state batteries

Victoria C. Ferrari, Nam S. Kim, Sang Bok Lee, Gary W. Rubloff and David M.
Stewart*

XPS spectrum for V₂O₅

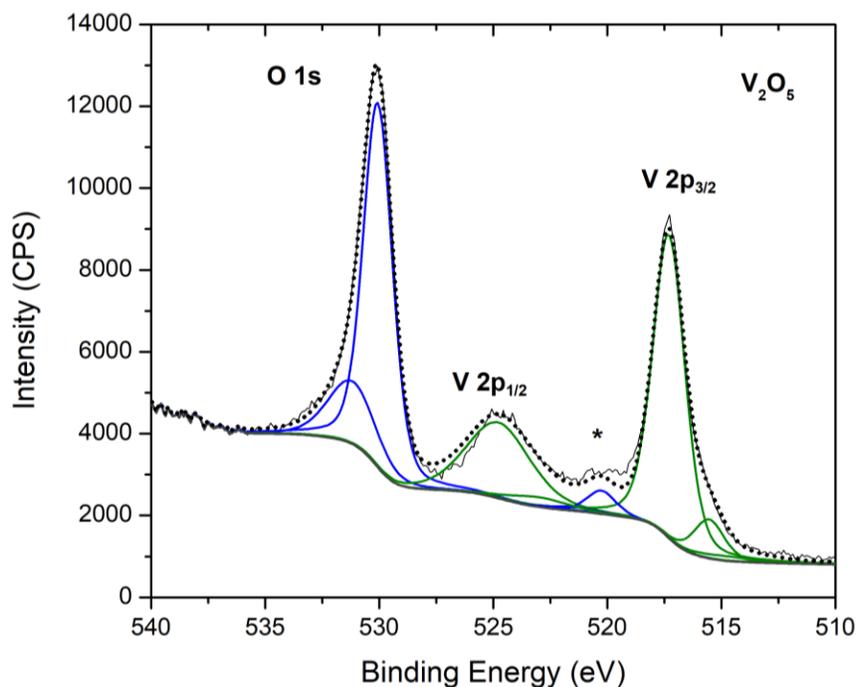


Figure S1: XPS data from V₂O₅ thin film. The asterisk indicates the oxygen satellite peak due to an achromatic source used for data acquisition.

XPS data for C 1s and Li 1s

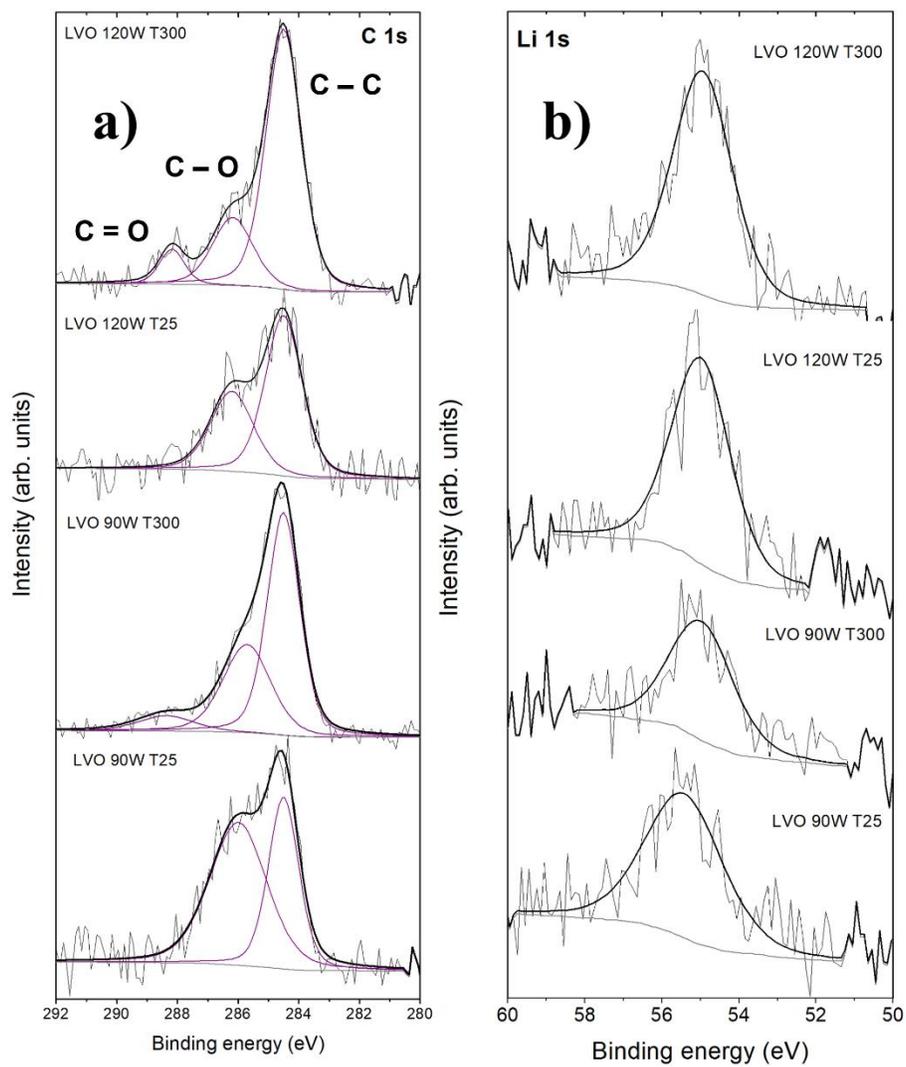


Figure S2: X-Ray Photoelectron Spectroscopy for LVO samples. a) spectra for high-resolution C 1s; b) spectra for high-resolution Li 1s.

Electrochemistry data for sputtered V₂O₅ post annealed at 500 °C

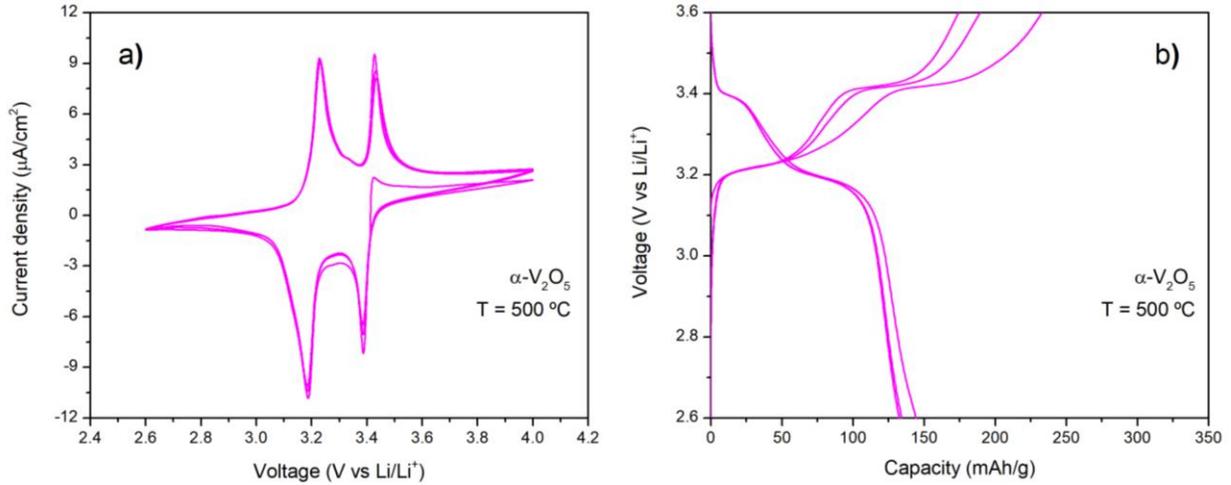


Figure S3: a) Cyclic Voltammetry at a scan rate of 0.1 mV/s and b) galvanostatic charge/discharge curves using a C-rate of 1C for sputtered V₂O₅ post-annealed at 500 °C.

Stability test for LVO 90W T25 sample

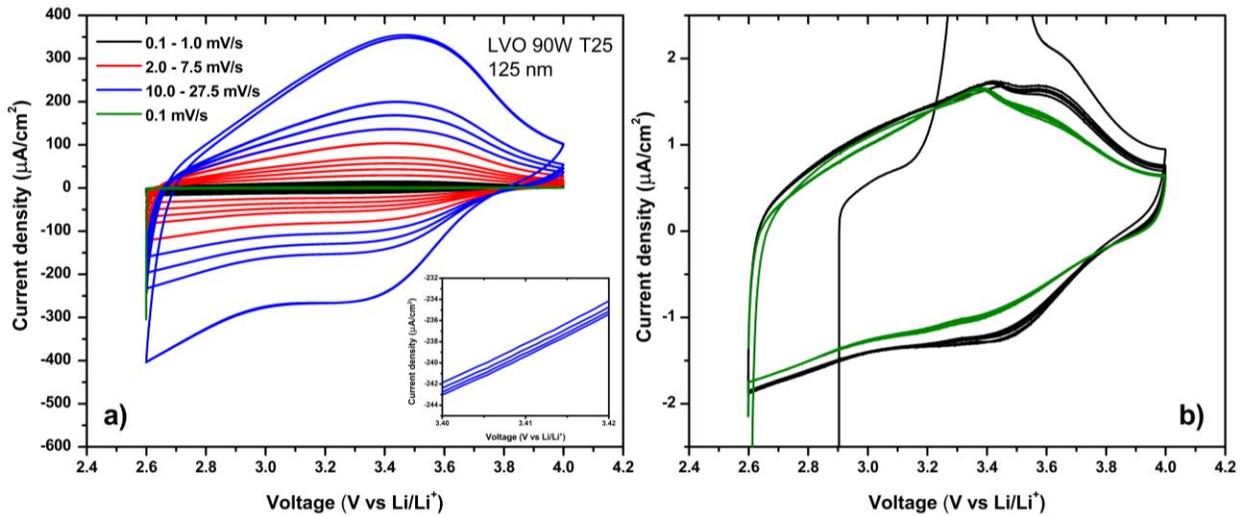


Figure S4: a) Cyclic voltammetry of LVO 90W T25 sample. inner cycles were performed with a lower scan rate, while outer cycles were at a higher scan rate. for each chosen voltage rate, 5 cycles were made. The inset graph shows the stability of the cycles from the same scan rate. b) A zoom in showing the CV done at 0.1 mV/s at the beginning (black curve) of the study and after (green curve) cycling in higher scan rates.

Reproducibility of the electrochemical behavior of LVO 90W T300 film

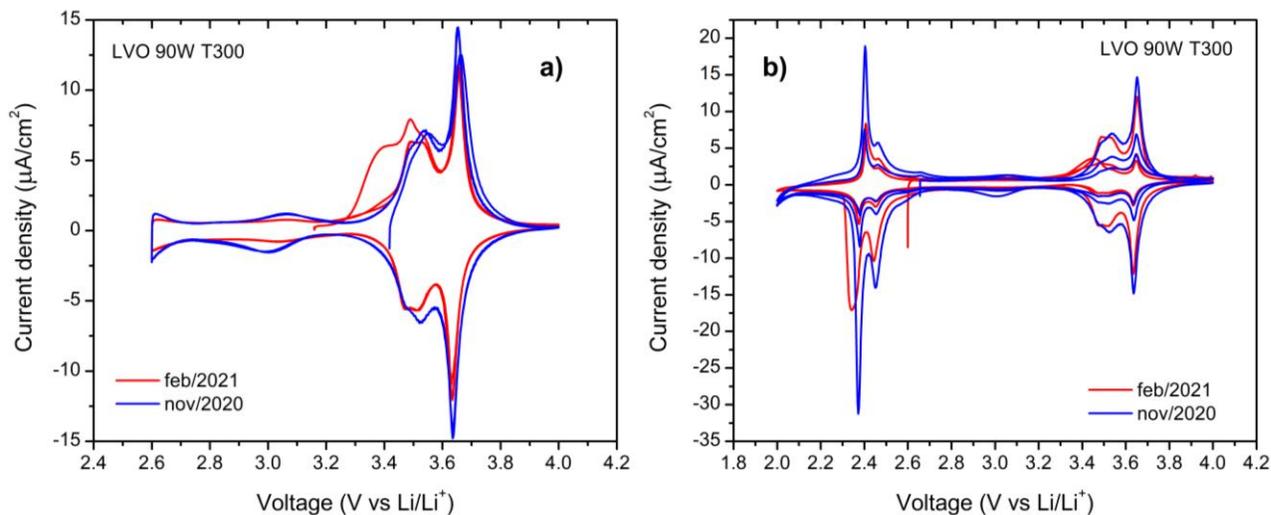


Figure S5: Cyclic voltammetry of the LVO 90W T300 samples. The blue curves represent one sample that was deposited on a Si substrate in November 2020, and red curves are from a sample made using the same conditions and using new sputtering targets in February 2021. a) CV curves for a 1-lithium insertion window, and b) CV curves for a 2-lithium insertion window. Both samples were cycled three times.

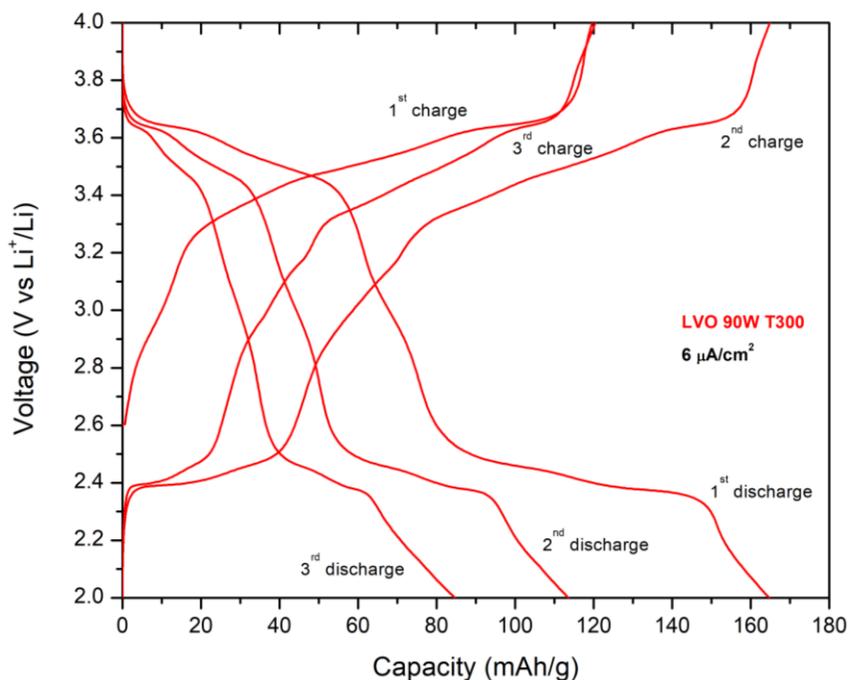


Figure S6: Galvanostatic charge/discharge cycles of LVO 90W T300 sample. First, this sample was cycled in a 1-Li voltage window, down to 2.6 V, then the galvanostatic charge/discharge cycles in a 2-Li voltage window shown here were performed.

Top-view SEM images of LVO samples

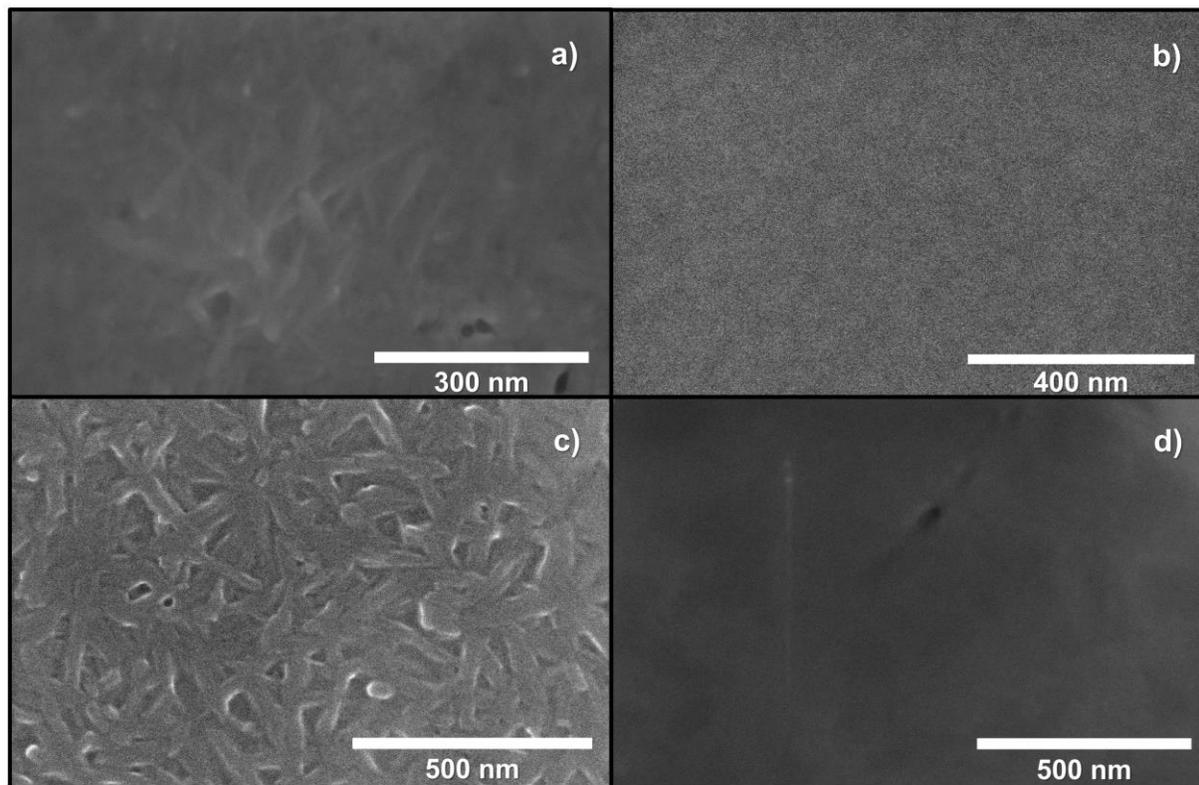


Figure S7: Top-view SEM images of a) LVO 90W T25, b) LVO 90W T300, c) LVO 120W T25, and d) LVO 120W T300.

Charge/discharge capacities of a solid-state device

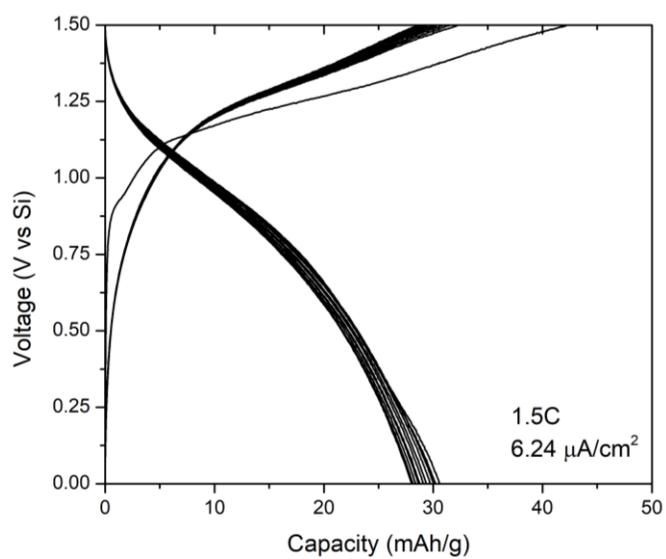


Figure S8: Ten charge/discharge capacity cycles normalized by the LVO (cathode) mass.