Supporting Information:

Al_2O_3 surface coating on $LiCoO_2$ through a facile and scalable wet-chemical method towards high-energy cathode materials withstanding high cutoff voltages

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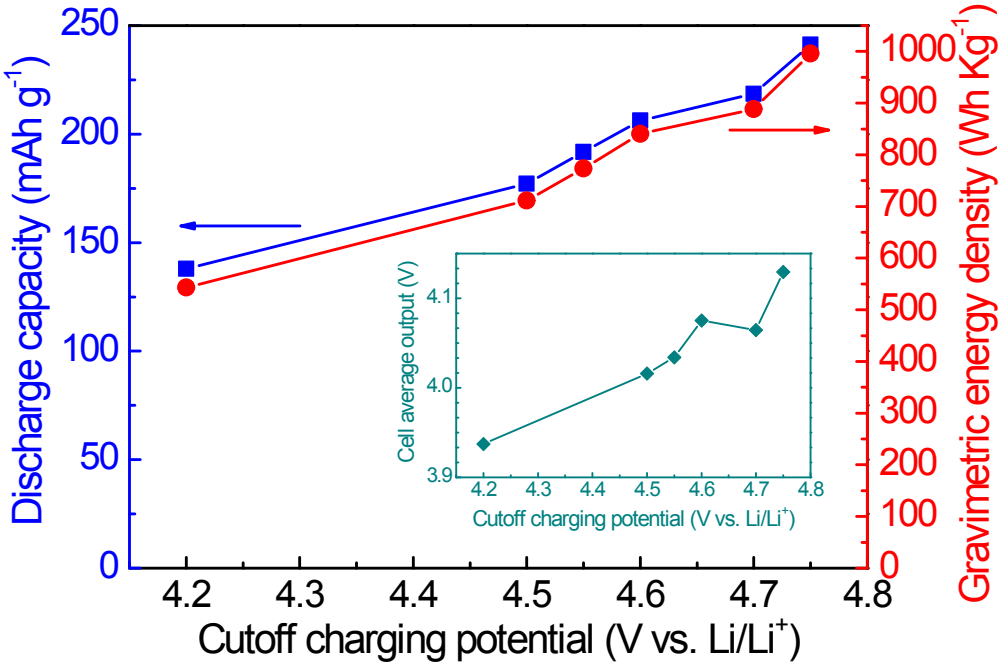

Fig. S1. Maximum specific capacity and gravimetric energy density of as-received commercial $LiCoO_2$ as a function of the cutoff charging potential cycled at 1 C. The inset shows the the dependence of the cell's average output voltage which is calculated by dividing the energy density by the discharge capacity.

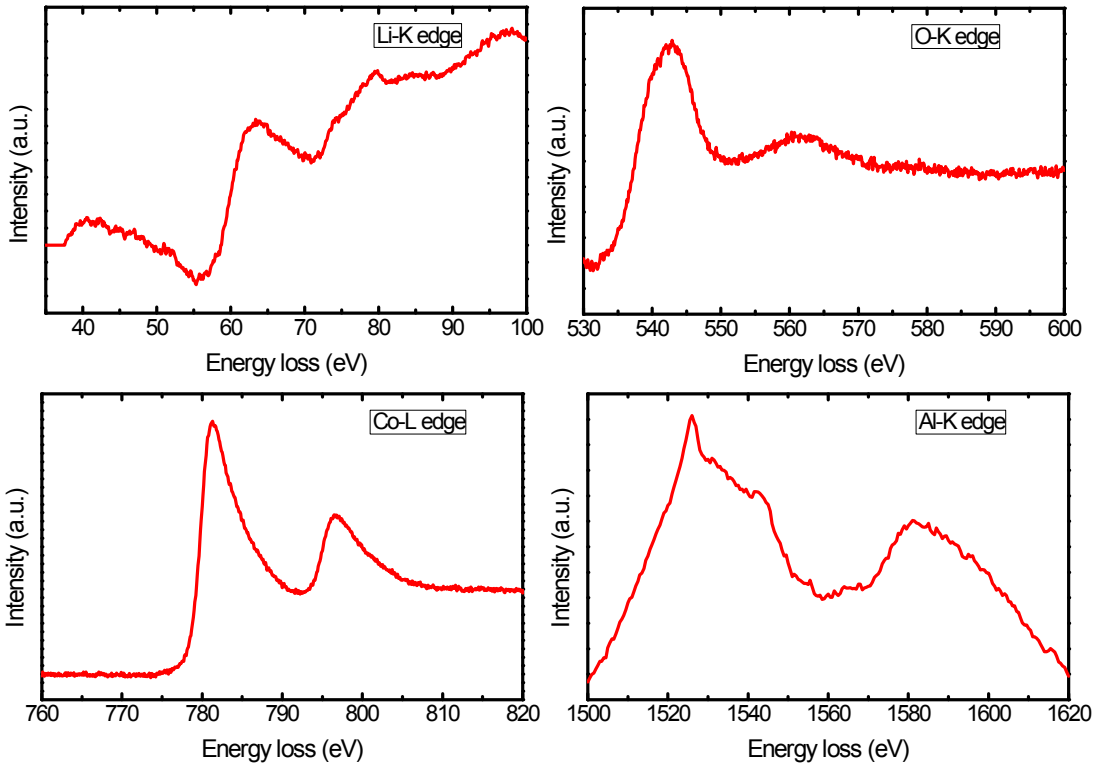

Fig. S2. EELS spectra of Li, O, Co and Al elements in the surface coating part of the AOLCO powders.

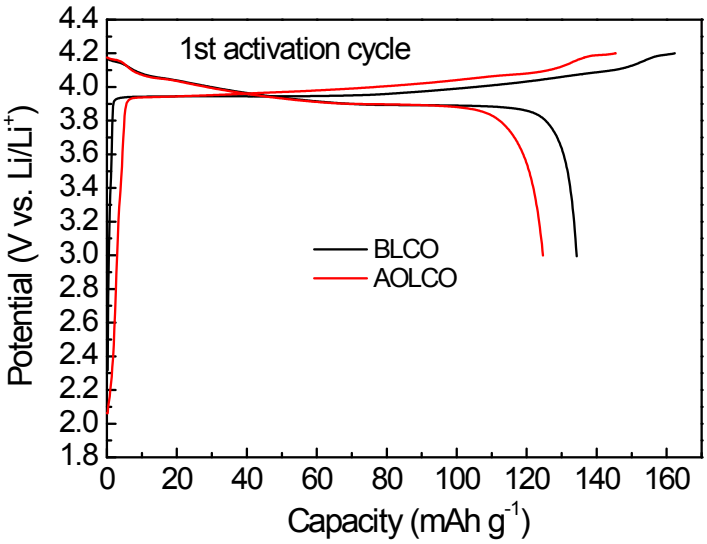

Fig. S3. Charge-discharge curves of BLCO and AOLCO during the 1st activation cycle within 3.0—4.2 V.

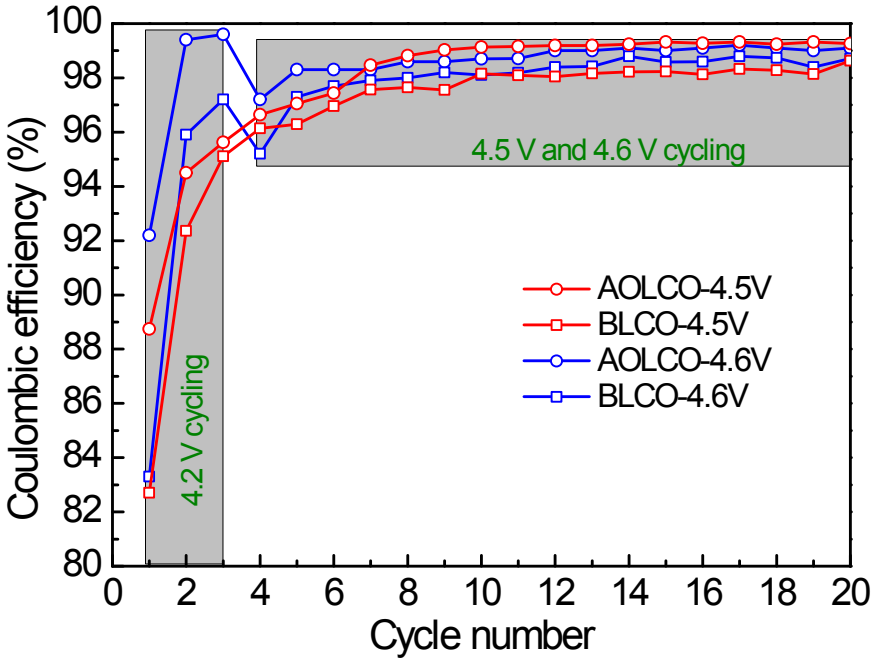

Fig. S4. Coulombic efficiency of BLCO and AOLCO electrodes during the first 20 cycles. The first 3 cycles were tested with 4.2 V cutoff voltage which is followed by cycling at higher voltages.

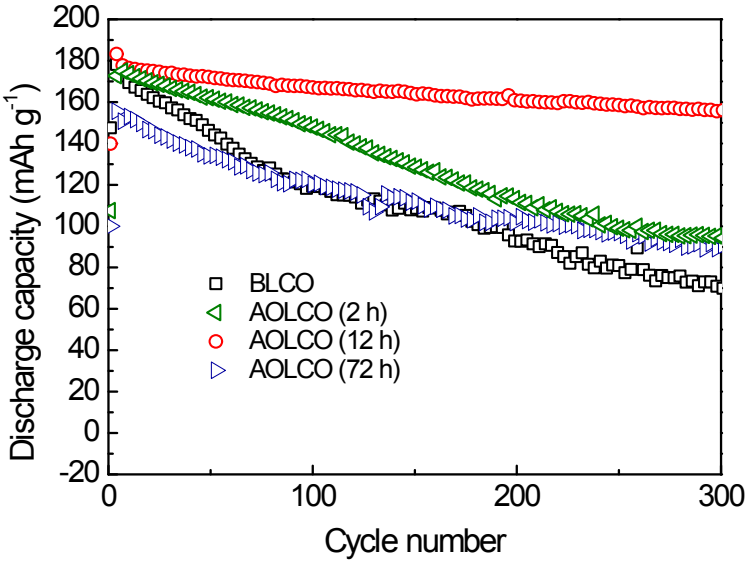

Fig. S5.Cycling stability of AOLCO electrodes with different coating time (stirring time in the solution) at 4.5 V cutoff, with current density of 1 C.

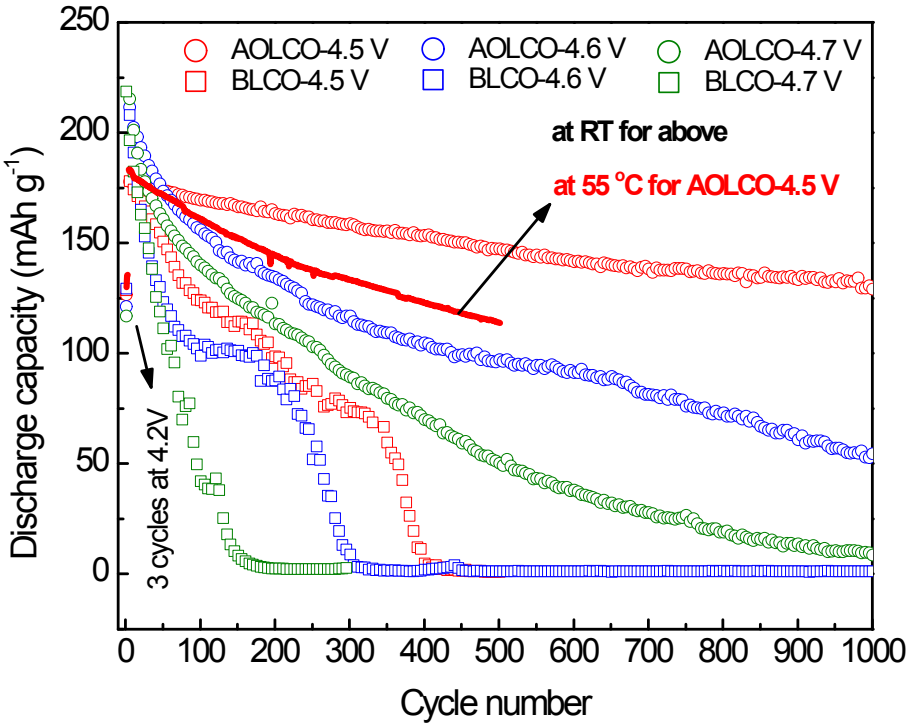

Fig. S6. Long-term cycling stability of BLCO and AOLCO electrodes at different cutoff voltages and temperatures. The current density is 1 C for all.

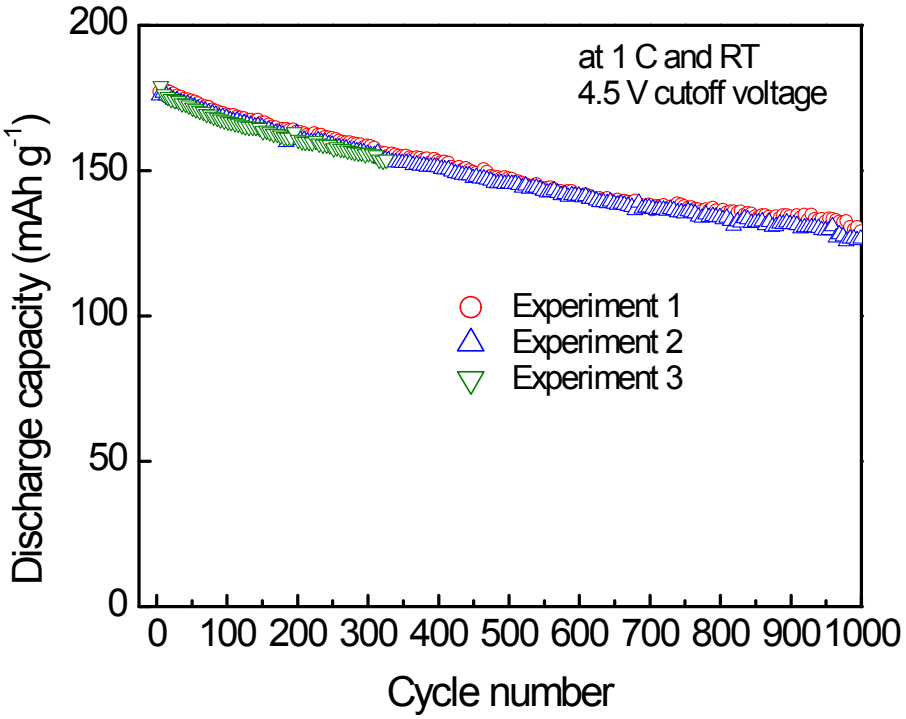

Fig. S7. Cycling performances of AOLCO electrodes prepared from three duplicated and independent experiments.

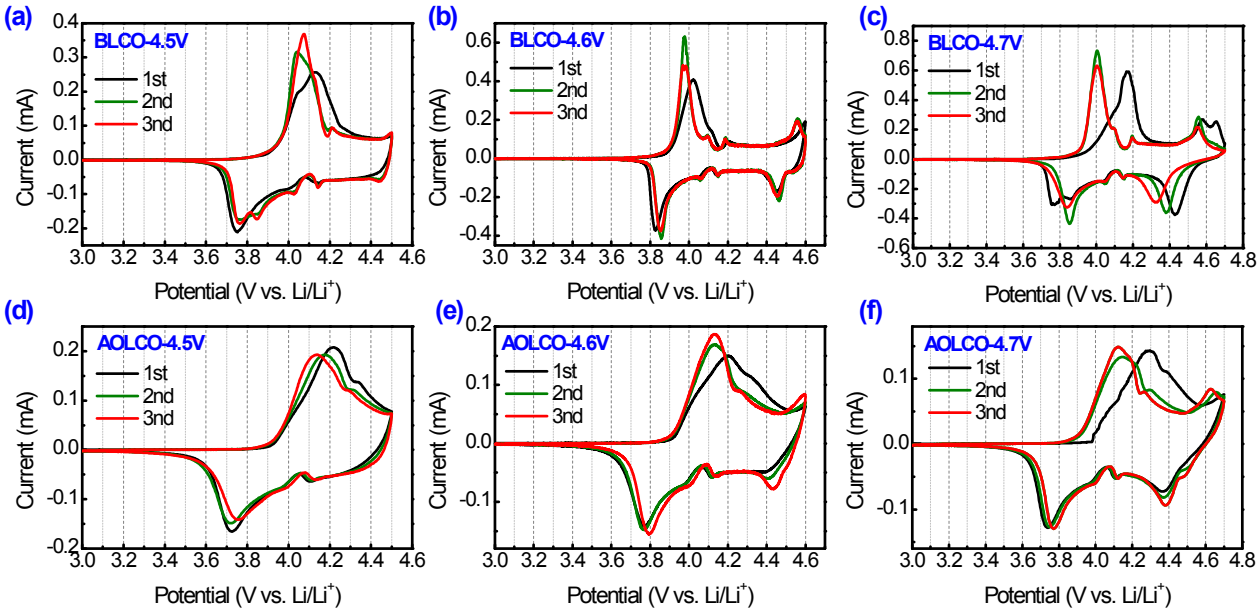

Fig. S8. CV profiles of the BLCO and AOLCO at different cutoff voltages during the first three cycles.

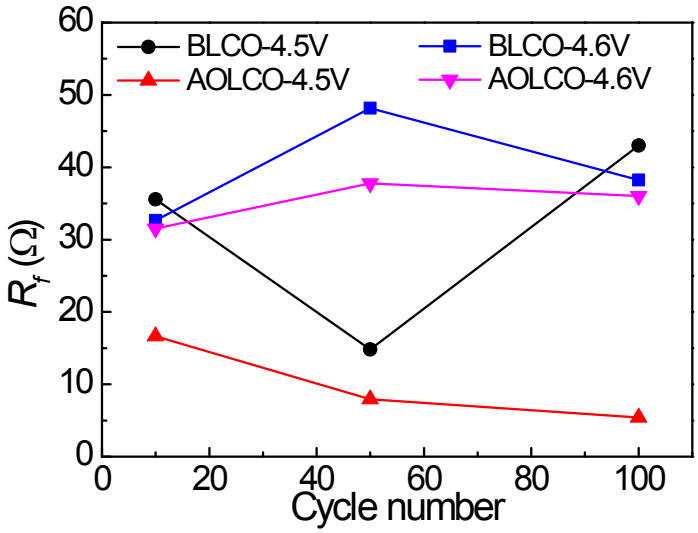

Fig. S9. Fitted surface layer resistance (R_f) of BLCO and ALCO after different number of cycles at 4.5 V and 4.6 V.

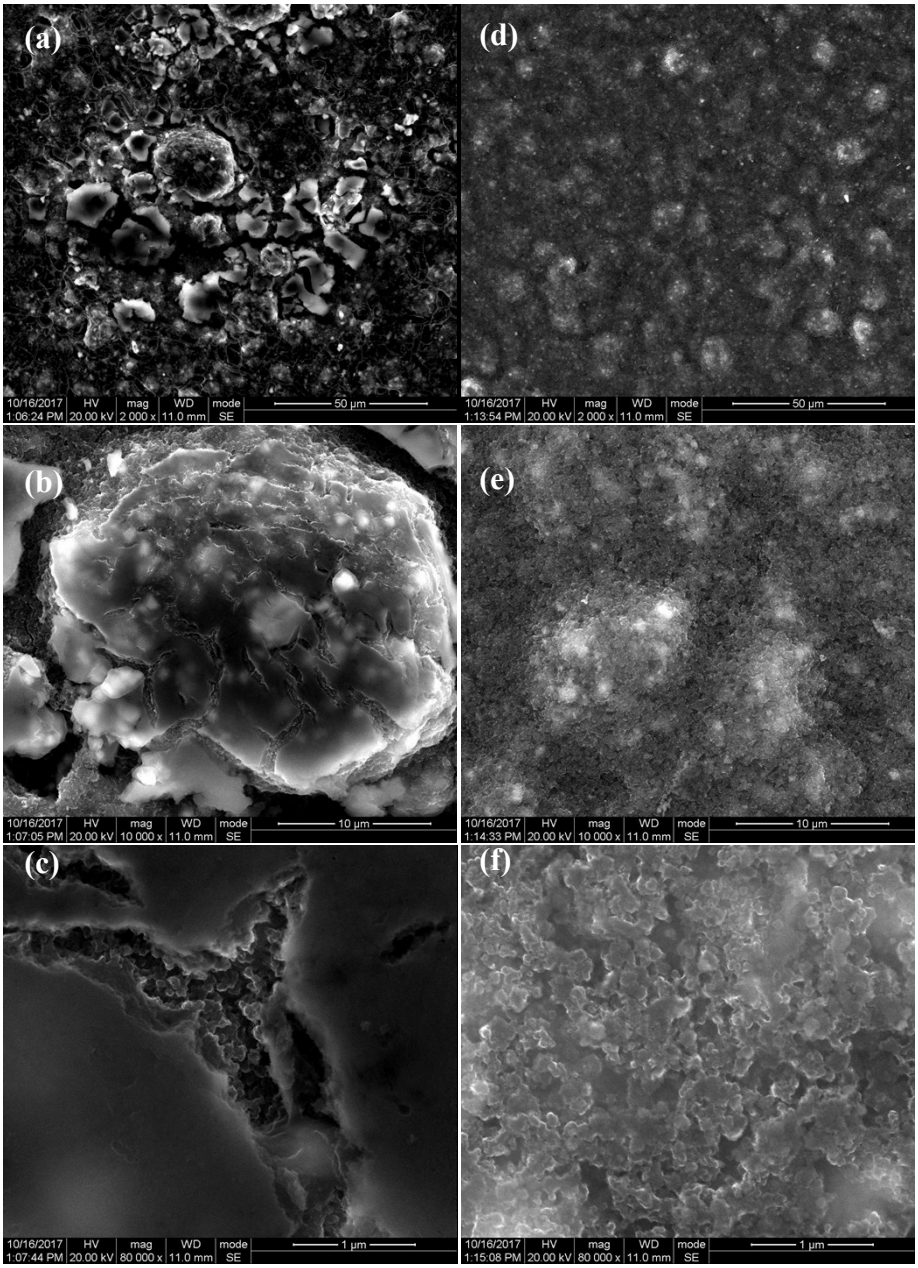

Fig. S10. FESEM images of bare LCO (a-c) and AOLCO (d-f) after cycling at 4.5 V for 500 cycles.

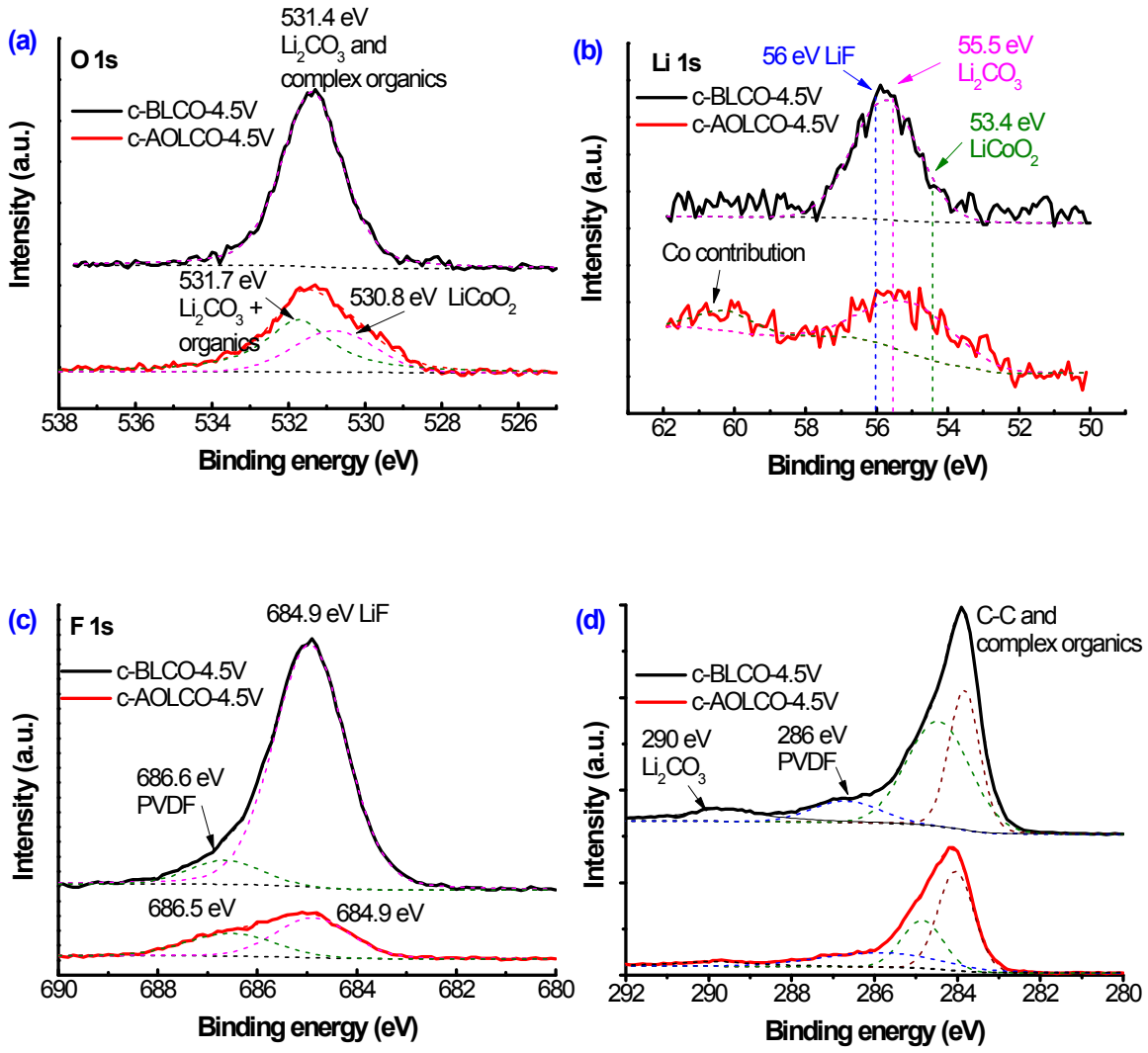

Fig. S11. XPS spectra analysis of the bare and coated electrodes cycled at 4.5 V cutoff for 500 cycles. (a) O 1s spectra, (b) Li 1s spectra and (c) F 1s spectra. All spectra were collected after 120 s of plasma etching.

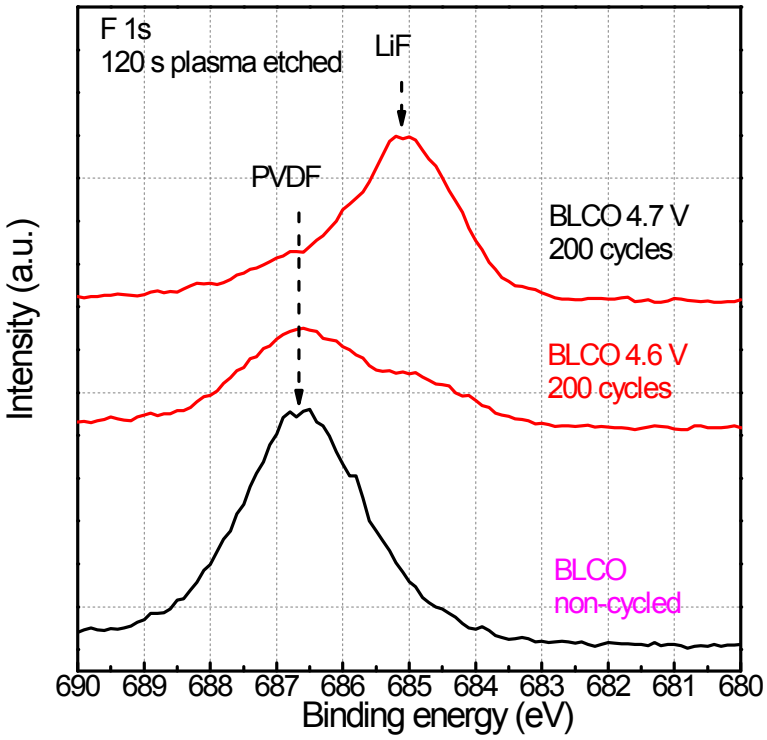

Fig. S12. Comparison of the F 1s spectra of BLCO before cycling and after 200 cycles at different cutoff voltages. All spectra were collected after 120 s of plasma etching.