Supplementary Information

Table S1. Calculations For Different Cell Formats And Areal Capacities

Property		Coin Cell	Single Sided Pair	Stacked Pouch
Cell capacity				
@ 1 mA hr cm^{-2}	/ A hr	0.0017	0.033	1.2
@ 3 mA hr cm^{-2}	/ A hr	0.0052	0.100	3.6
Electrolyte weight ratio				
@ 1 mA hr cm^{-2}	/ g $(A\ hr)^{-1}$	34.9	33.0	7.5
@ 3 mA hr cm^{-2}	/ g $(A\ hr)^{-1}$	11.6	10.0	2.5
Cell weight ratio				
@ 1 mA hr cm^{-2}	/ g $(A\ hr)^{-1}$	2560	570	29
@ 3 mA hr cm^{-2}	/ g $(A\ hr)^{-1}$	850	N / A	N / A

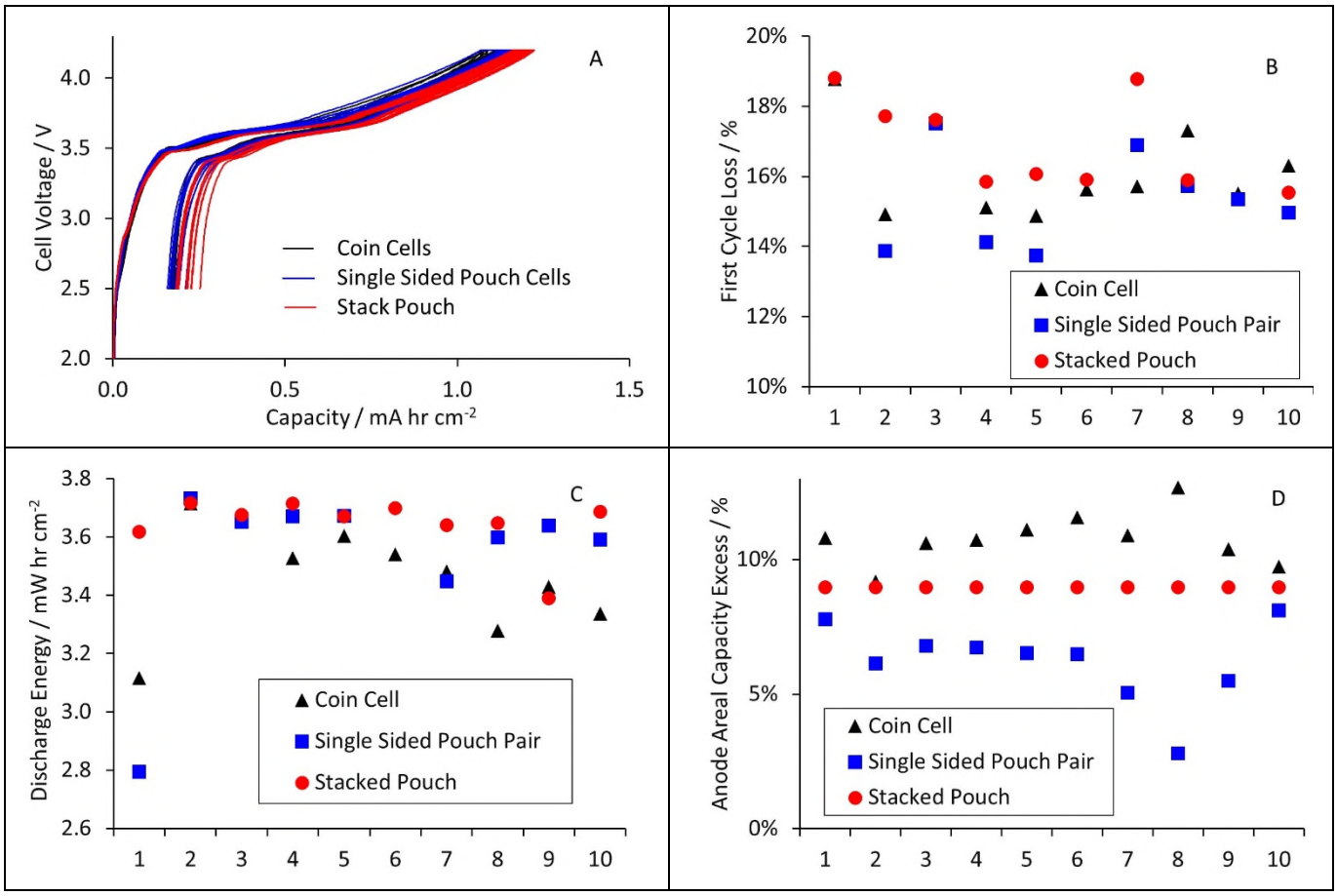

Figure S1. Further formation cycle results with A) cell voltages during formation cycle, B) first cycle loss values, C) areal discharge energies from formation cycle and D) areal excess of anode capacity.

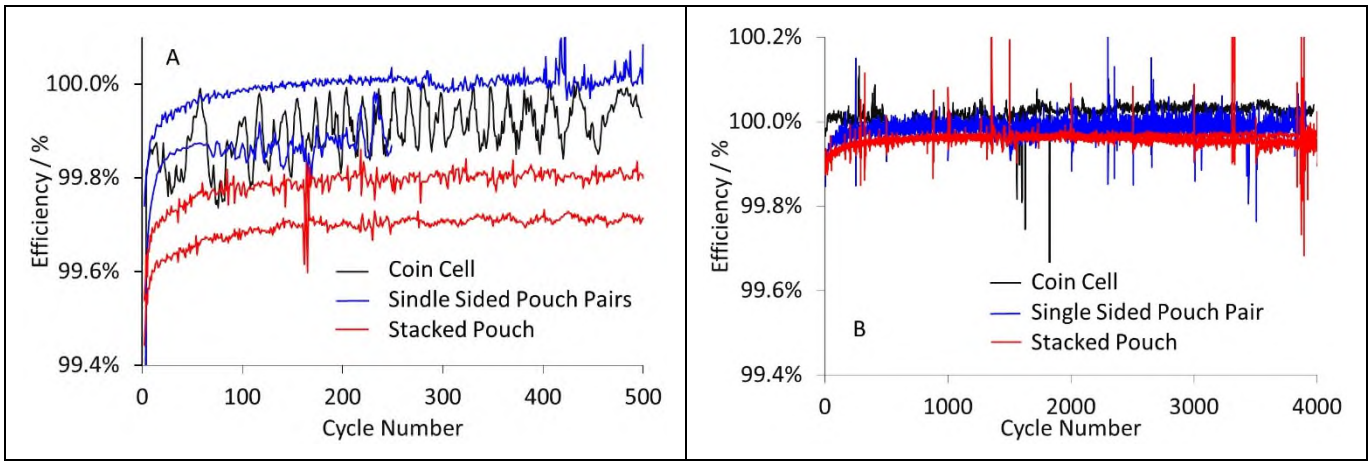

Figure S2. Coulombic efficiency measurements during cycling at A) ± C / 2 and B) ± 3 C.

NB. It should be noted that the efficiencies for the coin cells tests had to be averaged over five cycle to minimise noise. For the ± 3 C coin cell cycling, numerous spikes were removed manually.

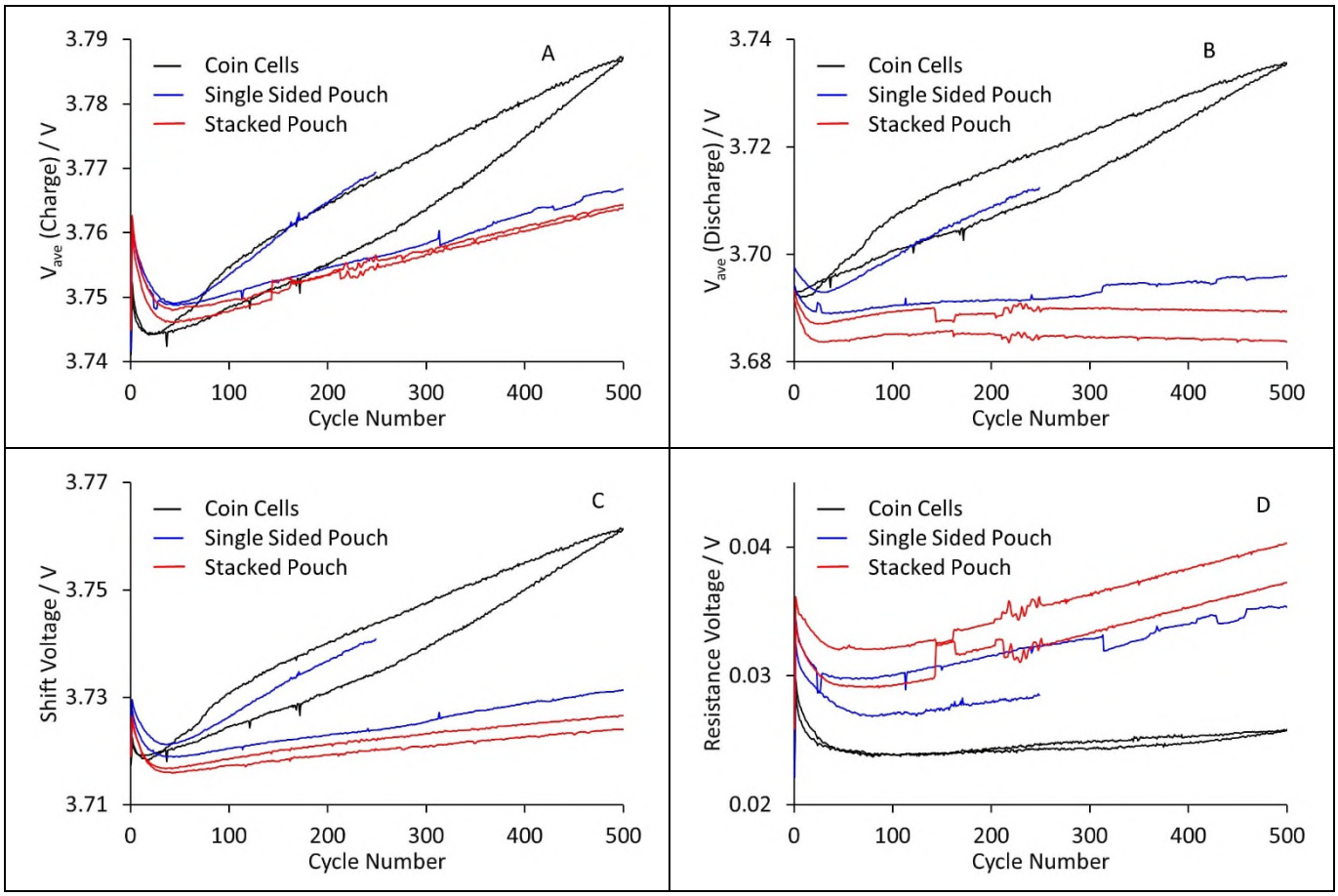

Figure S3. Average voltage calculations for cycling at ± C / 2, for A) charge, B) discharge, C) shift voltage, and D) resistance voltage.

Shift voltage = 0.5 x { V_{ave} (C) + V_{ave} (D) }
Resistance voltage = 0.5 x { V_{ave} (C) - V_{ave} (D) }

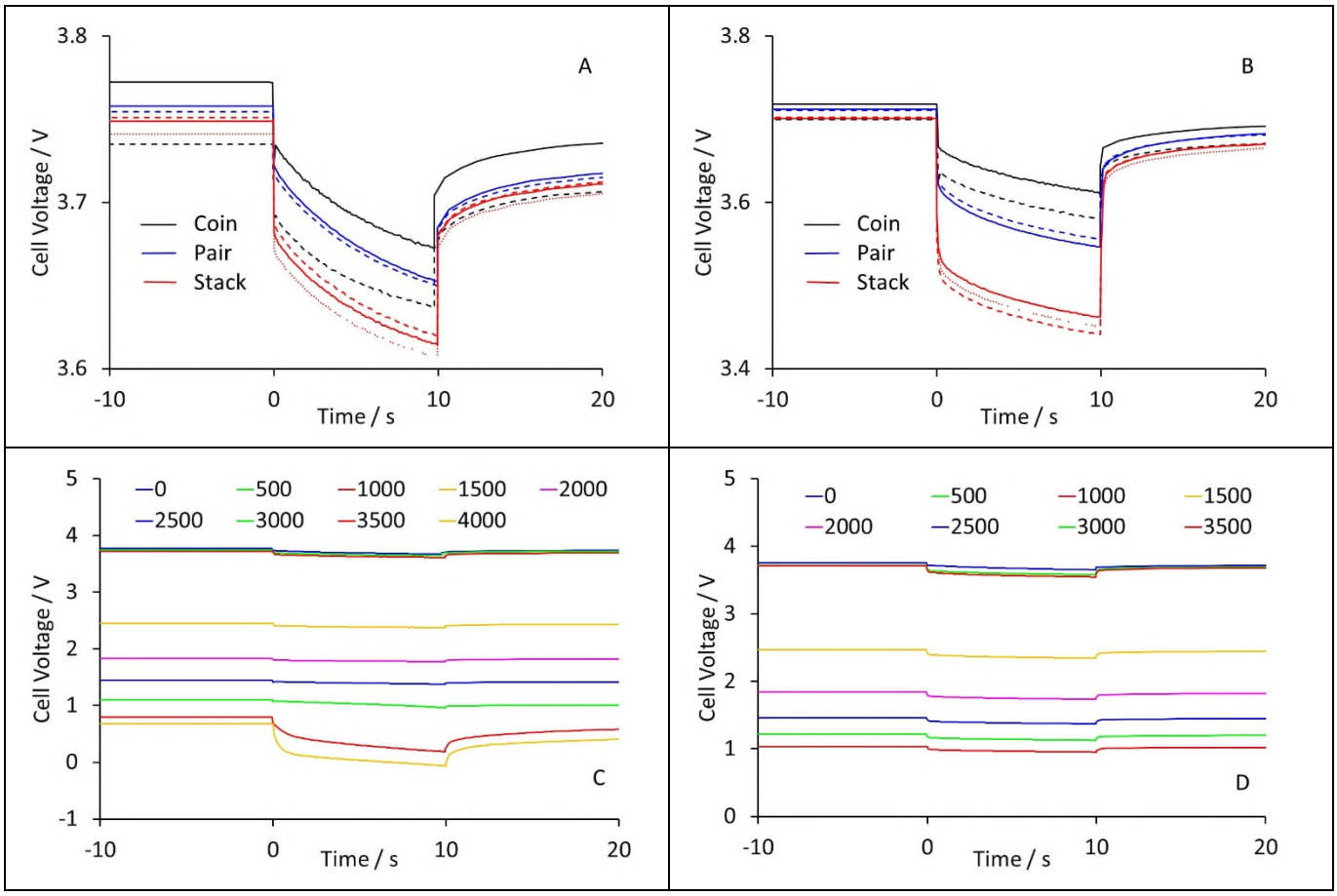

Figure S4. DC resistance measurements using 5 C pulses during cycling at ± 3 C, with A) all cells before cycling, B) all cells after 1,000 cycles, C) a coin cell, and D) a single sided pouch pair.

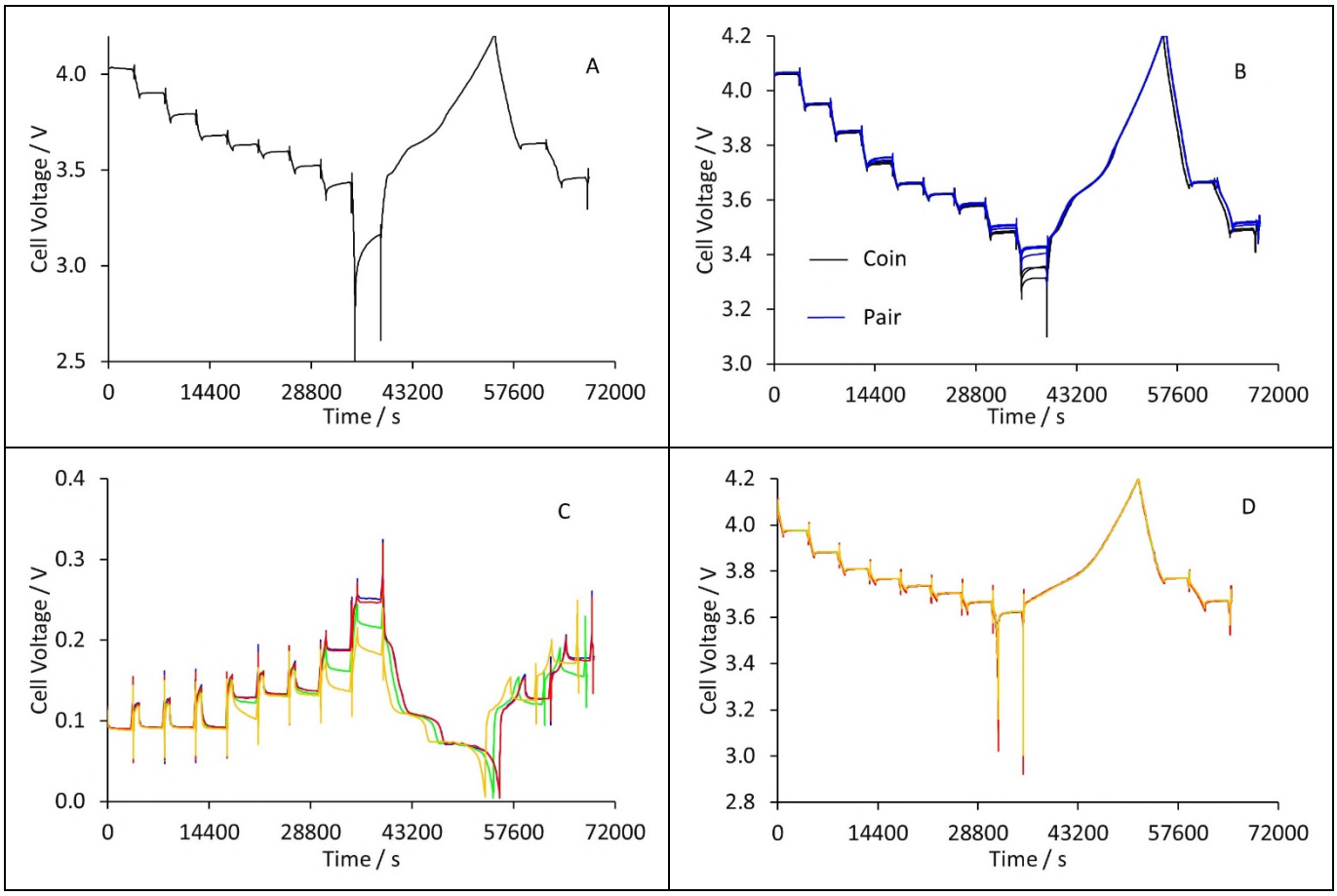

Figure S5. Cell voltages during ASI measurements for A) a higher resistance coin cell, B) other full cells, C) anode coin cell half cells, and D) cathode coin cell half cells.

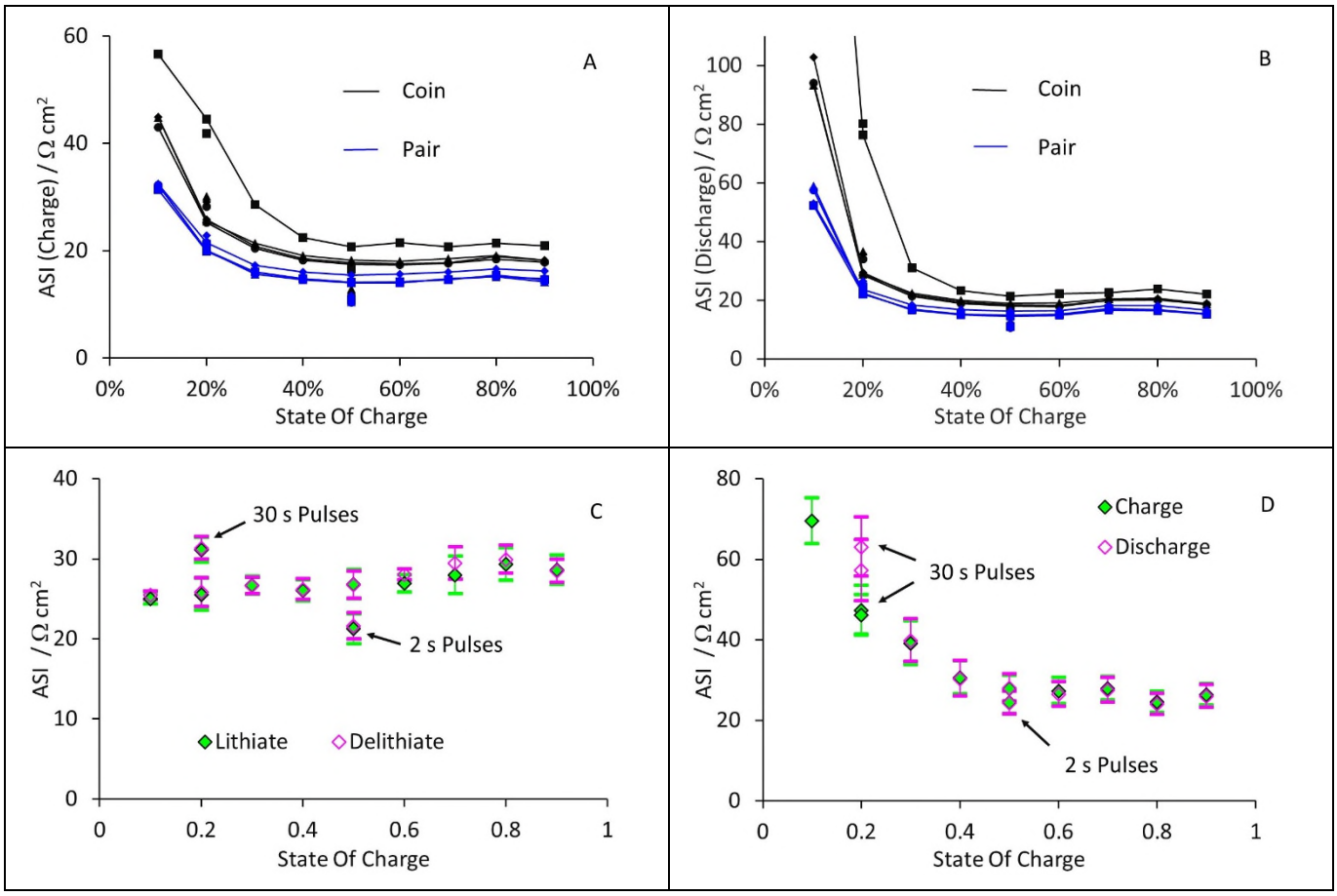

Figure S6. Calculated ASI values for A) full cells during charge pulses, B) full cells during discharge pulses, C) anode coin cell half cells, and D) cathode coin cell half cells.

For the half cells, the points are mean ± one standard deviation, based on four cells.

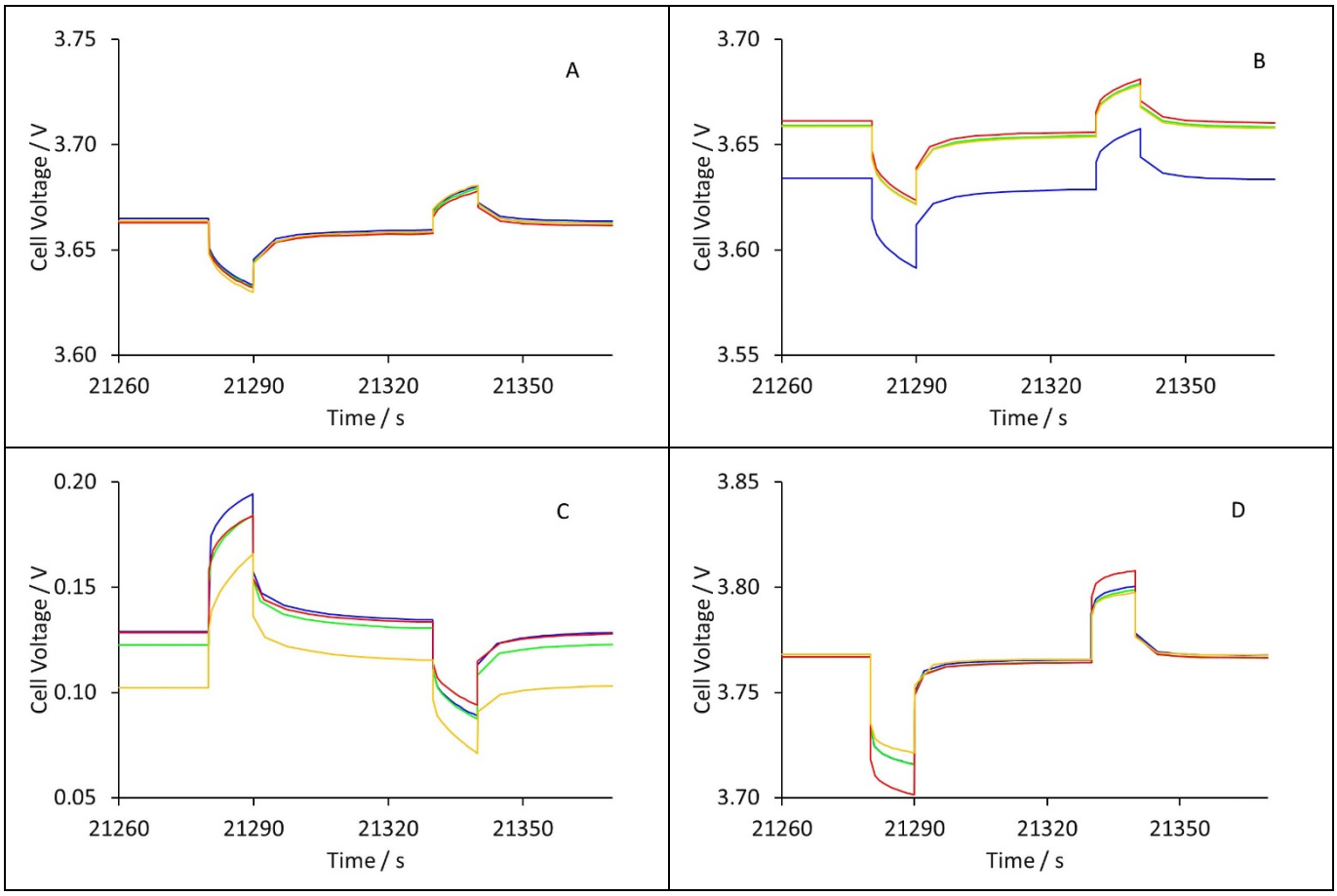

Figure S7. Voltage transients during ten second pulses at 50 % state of charge, for A) single sided pouch pair cells, B) coin cell full cells, C) anode coin cell half cells, and D) cathode coin cell half cells.

Table S2. Initial Voltage Drops During Pulses At 50 % State Of Charge

Cell Type	Initial Voltage Drop / mV				
	Cell 1	Cell 2	Cell 3	Cell 4	Median
Discharge (Delithiation)					
Single pair	13.6	13.3	14.5	15.6	14.0
Coin (full cell)	19.3	15.5	14.3	15.1	15.3
Coin (anode half cell)	45.3	29.6	29.5	26.6	29.6
Coin (cathode half cell)	33.4	32.7	48.7	32.8	33.1
Charge (Lithiation)					
Single Pair	9.3	9.0	8.1	10.8	9.2
Coin (full cell)	13.0	10.3	9.2	10.3	10.3
Coin (anode half cell)	23.2	20.0	19.8	19.2	19.9
Coin (cathode half cell)	21.9	22.1	31.2	21.5	22.0

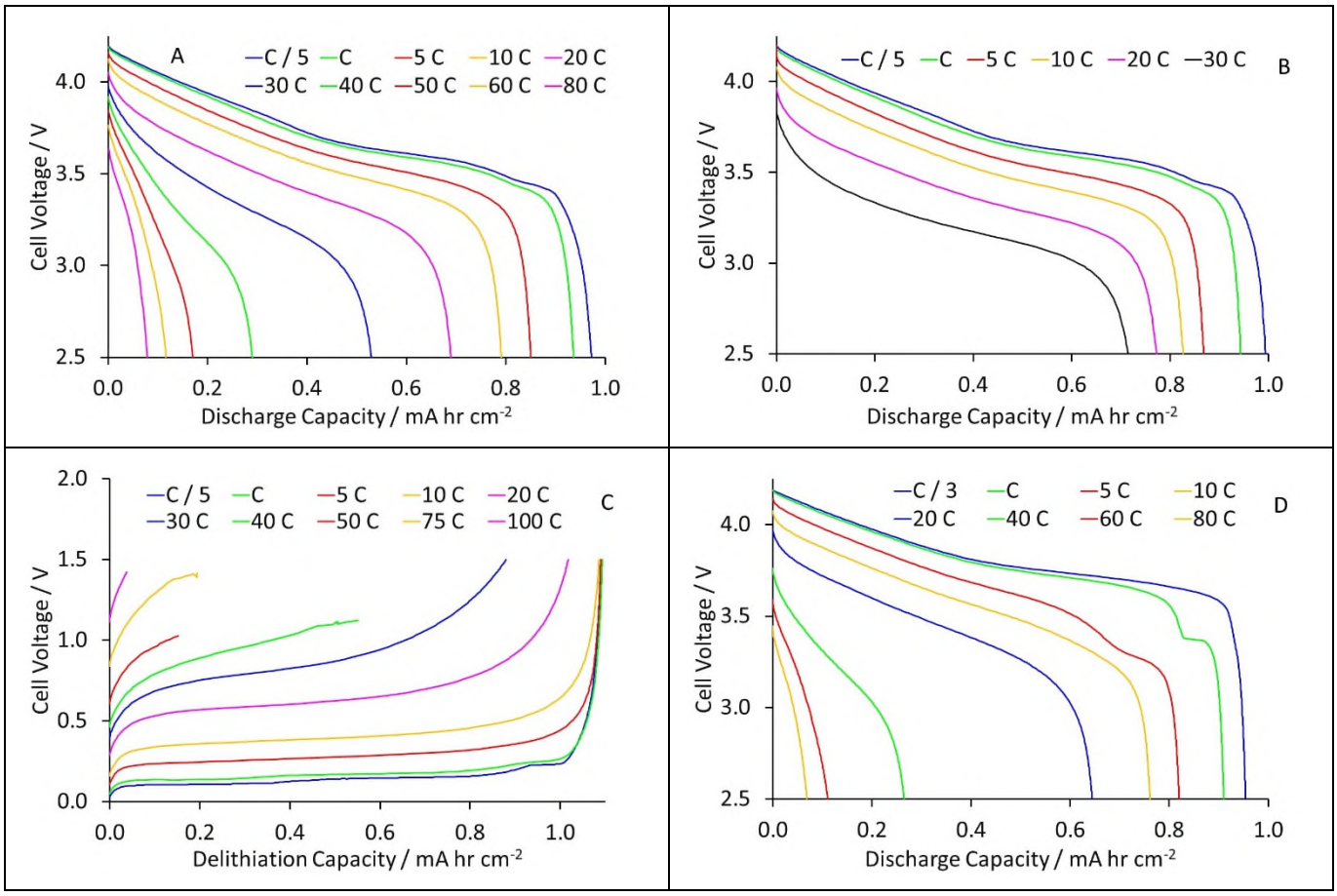

Figure S8. Discharge (or delithiation) voltages at different rates for A) a single sided pouch pair cell, B) a stacked pouch cell, C) an anode coin cell half cell, and D) a cathode coin cell half cell.

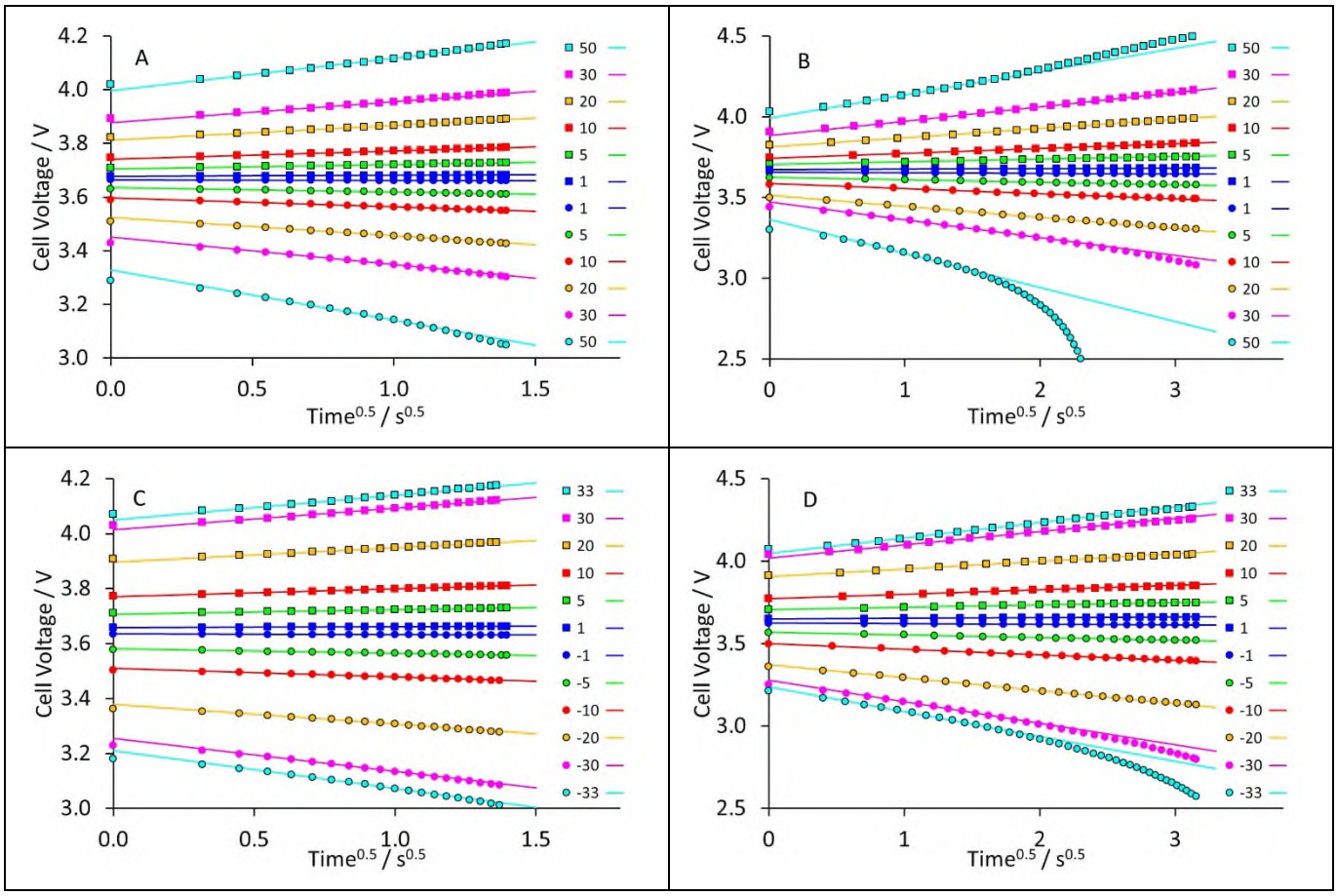

Figure S9. Cell voltages during pulses for A+B) single sided pouch pair cell, C+D) stacked pouch cell, A+C) two second pulse duration, and B+D) ten second pulse duration.

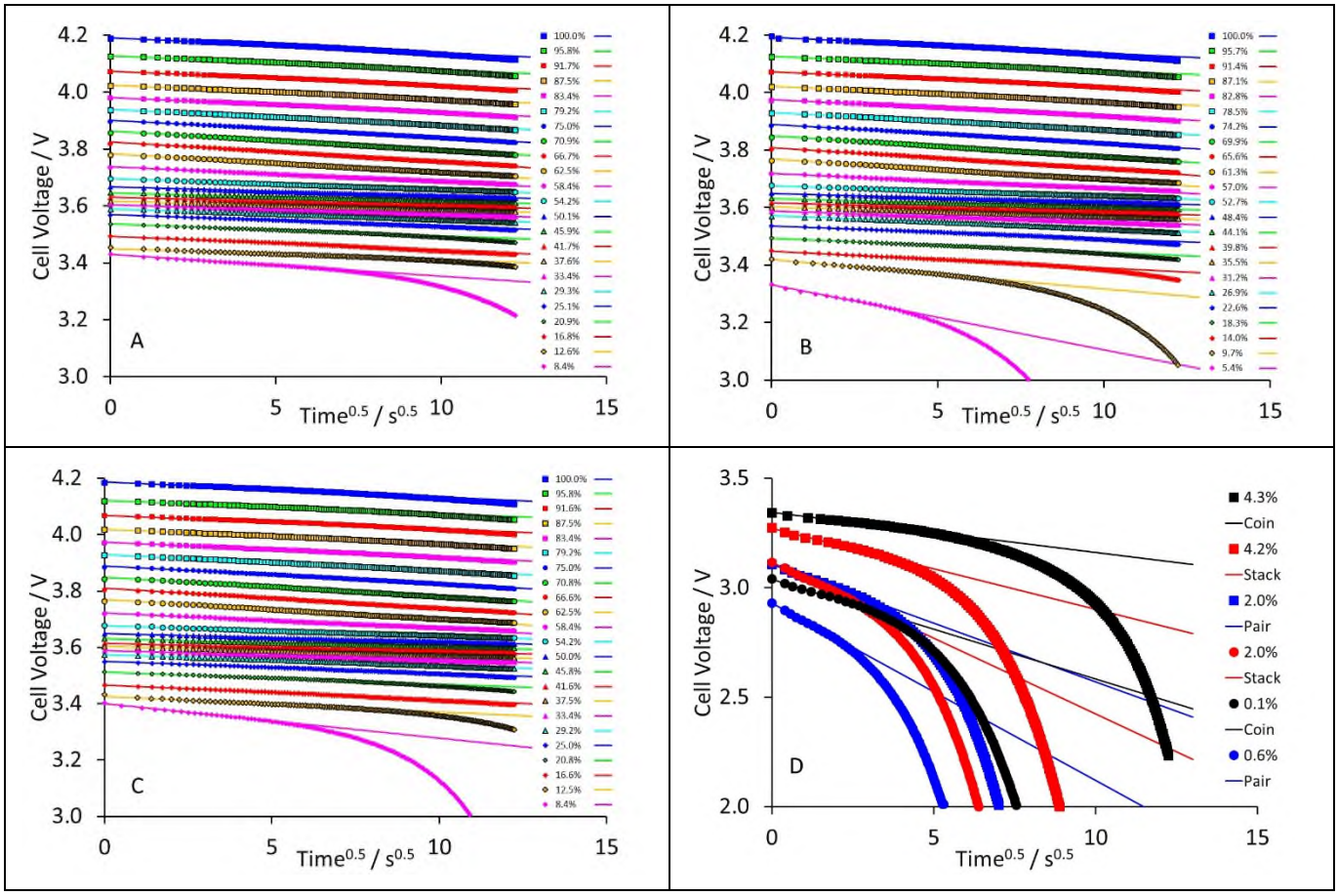

Figure S10. Cell voltages during GITT discharge pulses for A) a coin cell, B) a single sided pouch pair, C) a stacked pouch cell, and D) all cells at low states of charge.