Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplemental Information

Preventing lithium plating under extremes: an untold tale of two electrodes

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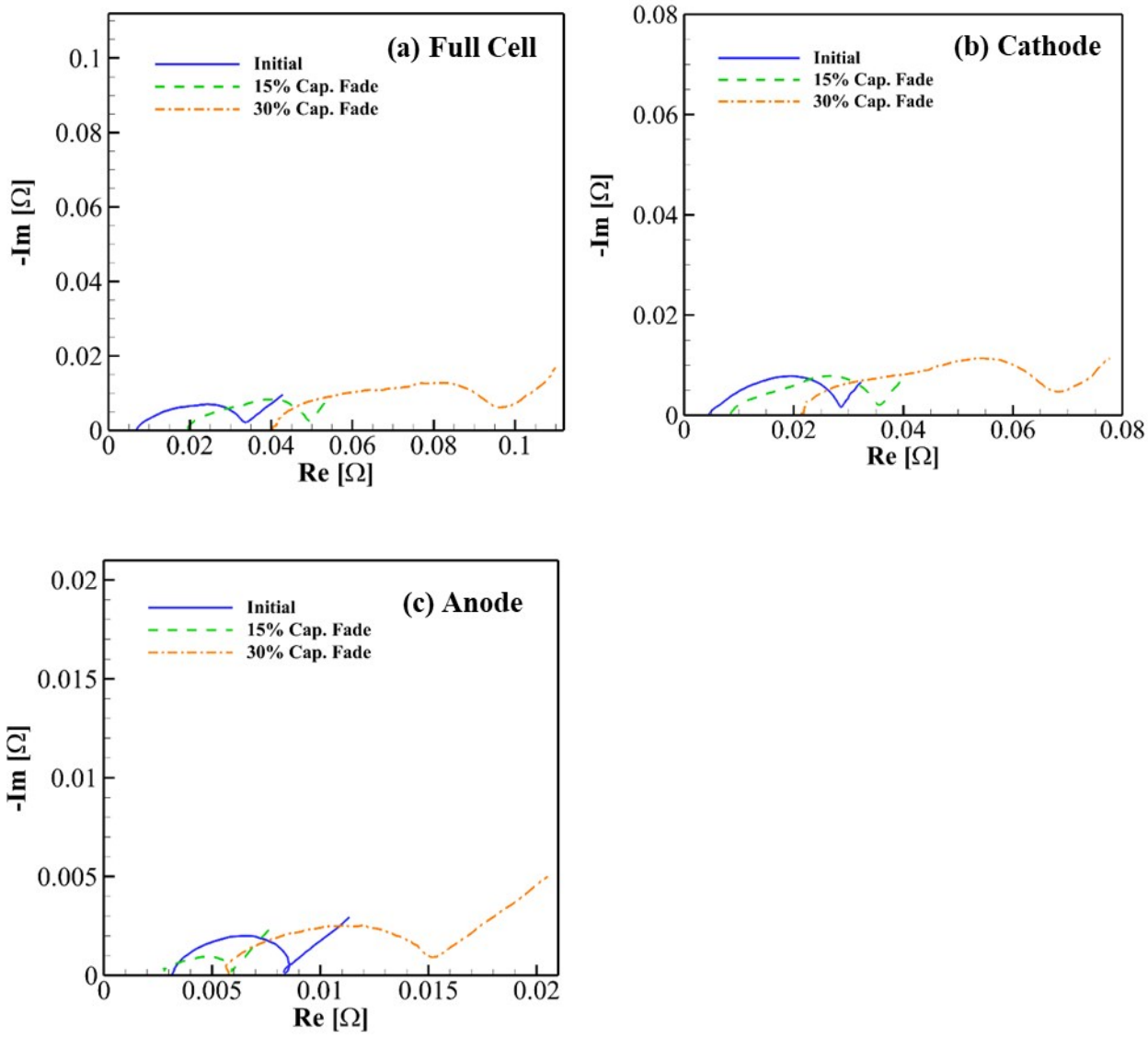
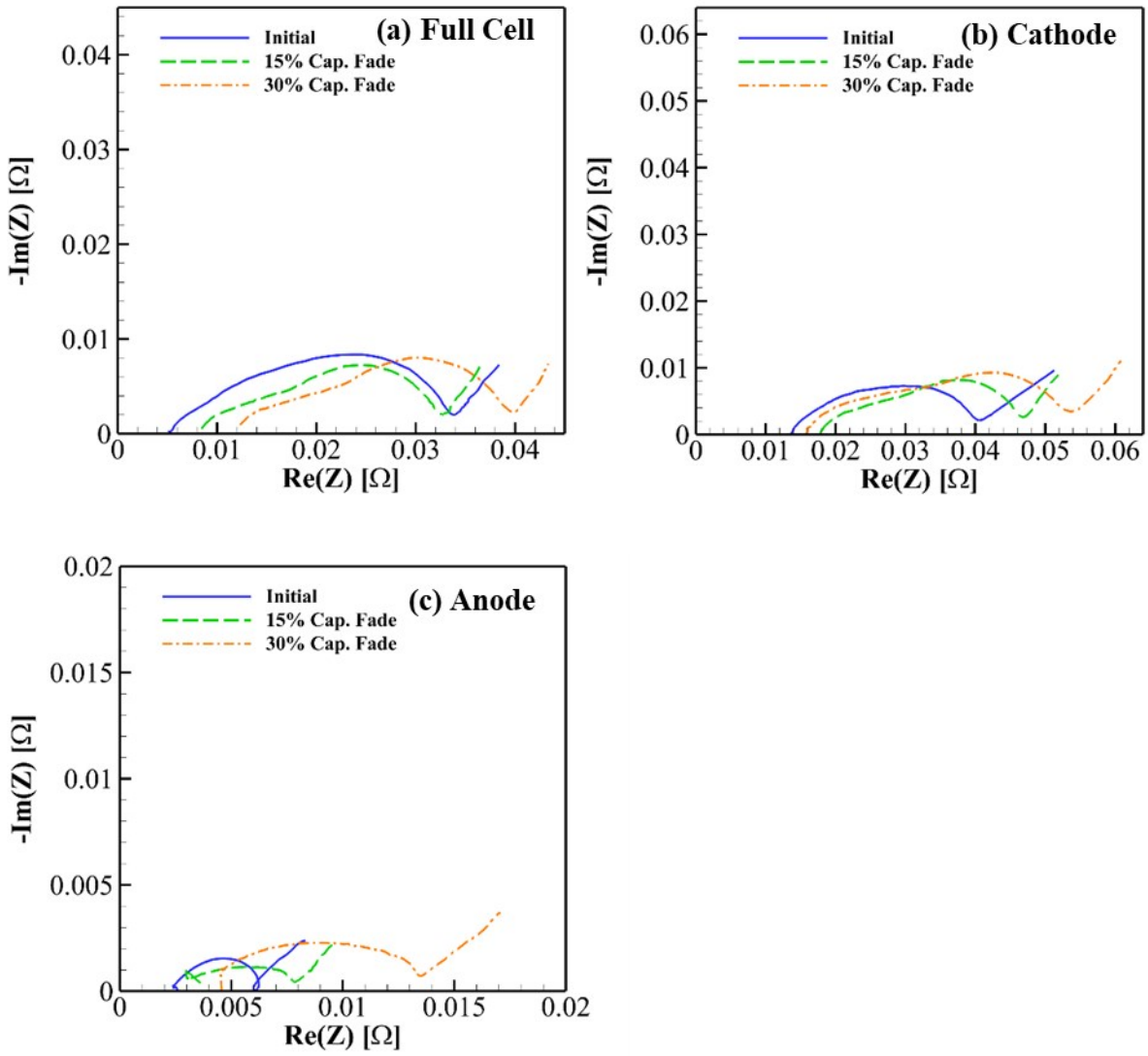
Table S1. Half-Cell OCV Test Procedure

Cell Type	Test Step	Limits
Graphite Anode	C/25 CC Discharge	V < 0.001 V
	CV Discharge at 2.75V	I < -0.05 mA
	C/25 CC Charge	V > 1.3 V
	CV Charge at 4.2V	I < 0.05 mA
LCO Cathode	C/25 CC Charge	V > 4.5 V
	CV Charge at 4.2V	I < 0.05 mA
	C/25 CC Discharge	V < 3.5 V
	CV Discharge at 2.75V	I < -0.05 mA

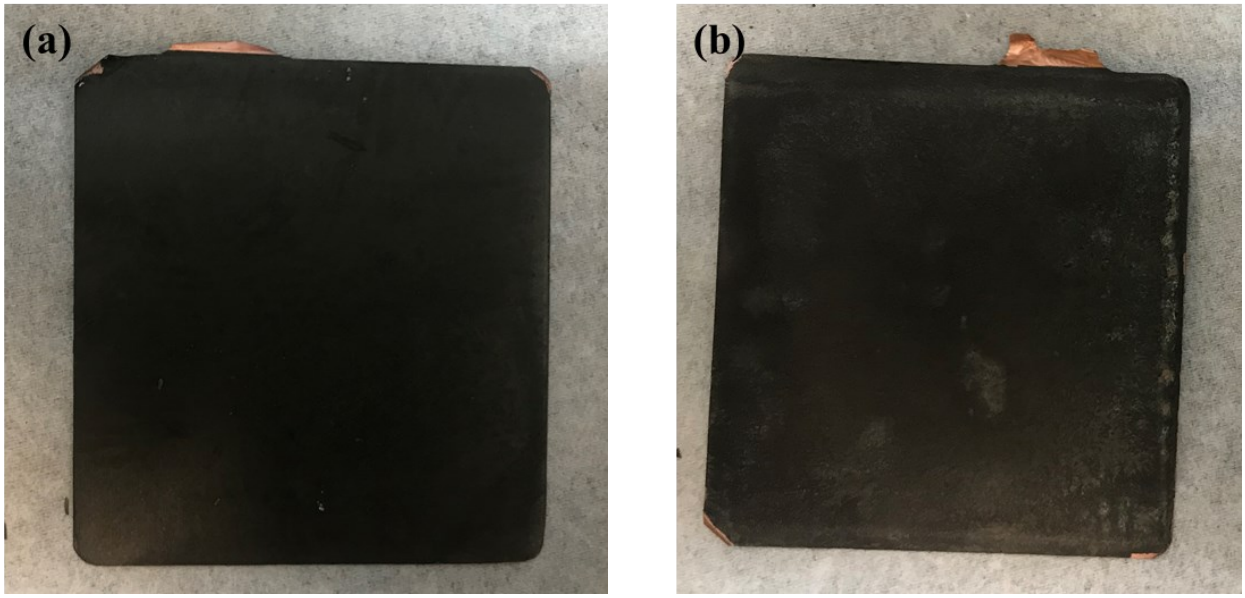
S1. EIS spectra of the BMS cycled cell at 0%, 15%, and 30% capacity fade increments for the (a) full cell, (b) cathode, and (c) anode. The full cell EIS semicircle widens has the cell degrades. A large increase in cathode impedance is observed at the 30% capacity fade point, which was observed in the relaxation resistances in Figure 3(a). A slight increase in anode resistance is also observed, which corresponds to SEI layer growth increasing the charge transfer resistance.



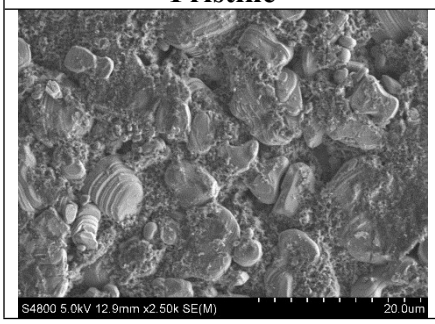
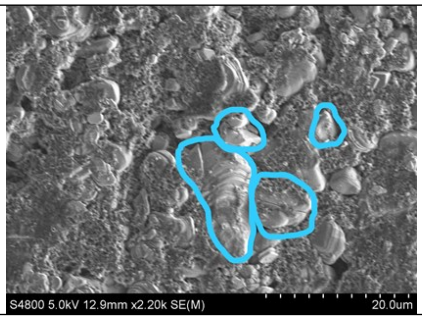
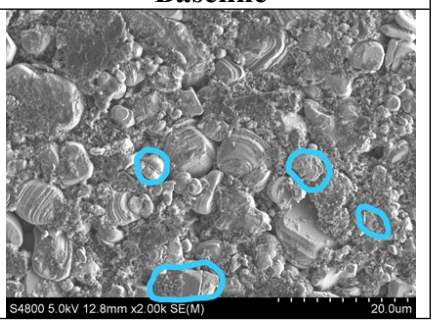
S2. EIS spectra of the baseline cell at 0%, 15%, and 30% capacity fade increments for the (a) full cell, (b) cathode, and (c) anode. The cathode semicircle width slightly increases after 30% capacity fade, but the largest increase is apparent in the anode impedance. Lithium plating and passivation layer formation cause the increase of anode impedance.



S3. Images of the anode electrodes sheets from the (a) BMS cell and (b) baseline cell. The baseline anode shows clear lithium plating deposits, particularly at the edges of the electrode.



S4. LCO cathode SEM images of the pristine cell, the BMS cycled cell, and the baseline cell cathodes. Particle cracking was observed in both BMS cycled and baseline cathodes.

Pristine	BMS	Baseline
		

S5. (a) Relaxation resistances of a second cell cycled with the BMS. Cathode resistance rises considerably near the end of cycling while anode resistance only increases slightly. (b) Maximum cathode potentials of the two cells show the second BMS cell reaches higher cathode potentials than the first BMS cell. (c) Normalized capacity curves show a rapid drop in capacity in the second BMS cell. The high cathode potentials observed in the second BMS cell correspond to a rise in cathode resistance and a more sudden loss of capacity.