Battery Degradation Under Fast Charging

Presenter Sofia Mendes
Institution Southeast University

August 27, 2026

Outline

1. Motivation

2. Method

3. Results

4. Conclusion

1. Motivation

Why Fast Charging Matters

Fast charging cuts wait time from hours to minutes, but every extra amp pushed through a cell accelerates capacity loss.

- Consumer demand for sub-20-minute charging keeps growing
- Degradation mechanisms are well studied at low rates, less so above 3C
- This work isolates the fast-charging contribution specifically

2. Method

Test Protocol

Group	Charge rate	Cycles
Baseline	1C	500
Fast	3C	500
Ultra-fast	5C	500

Capacity measured every 25 cycles under identical discharge conditions.

What We Tracked

- Capacity fade relative to first-cycle baseline
- Internal resistance growth
- Post-mortem electrode imaging on a subset of cells

3. Results

Capacity Fade by Charge Rate

Rate	100 cyc.	300 cyc.	500 cyc.
1C	98.4%	94.1%	89.7%
3C	96.2%	88.3%	79.5%
5C	93.8%	79.6%	64.2%

5C charging loses capacity roughly three times faster than the 1C baseline by cycle 500.

Where the Loss Comes From

Post-mortem imaging on the 5C group shows visible lithium plating on the anode edge, concentrated near the tab – consistent with localized current density rather than uniform aging.

4. Conclusion

Takeaways

- Fast charging above 3C accelerates fade disproportionately
- Plating, not uniform SEI growth, drives most of the extra loss
- Edge-focused current density suggests a tab-design fix is worth testing

Thank You

Questions?

sofia.mendes@example.edu