

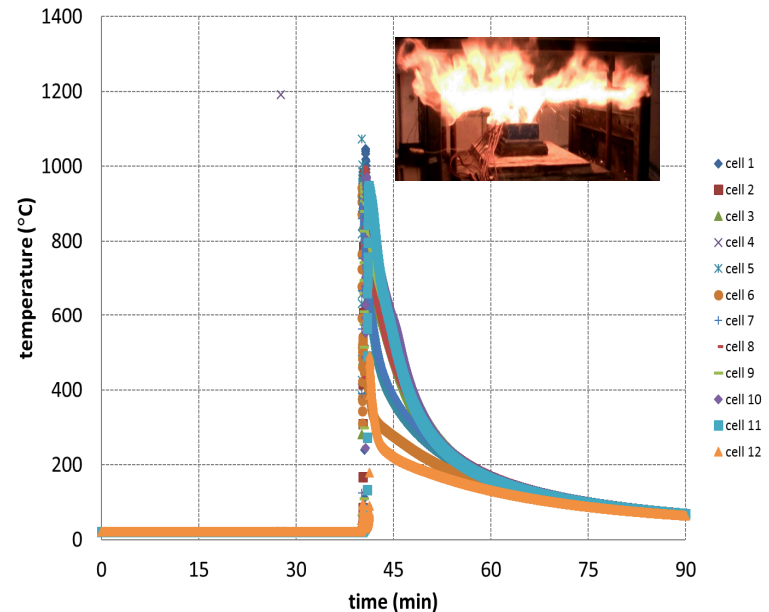
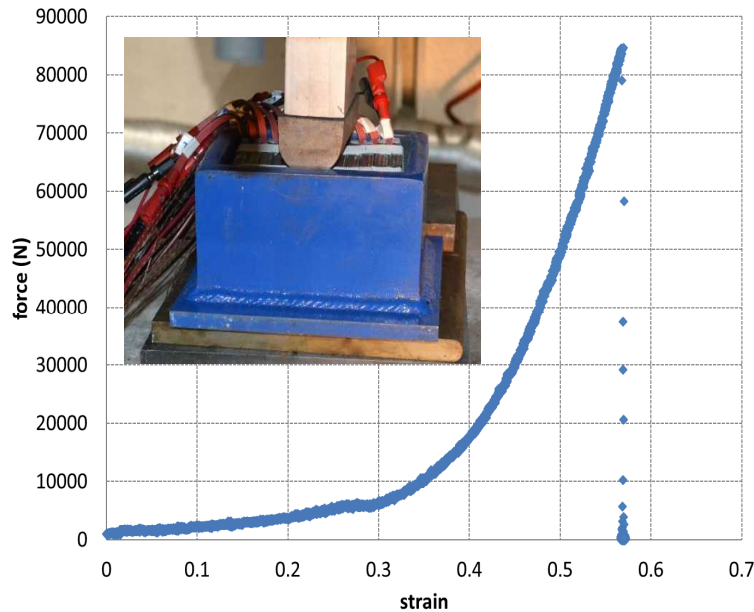
CAEBAT Quarterly Review

Joshua Lamb

December 8, 2016



Edge impact – Determination of Failure point for Discharged CT

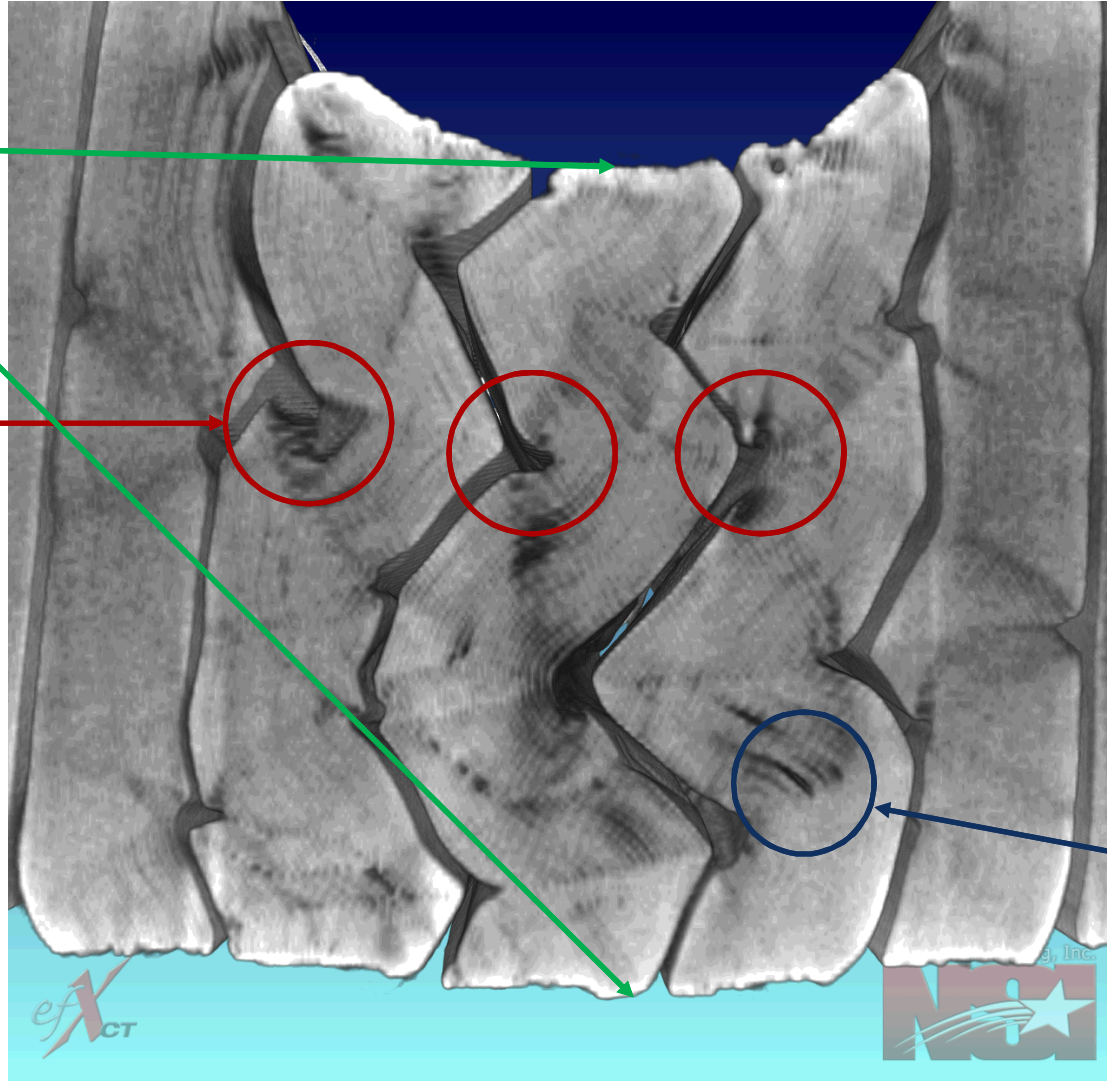


Crush data used to determine point of battery failure
Performed on discharged cell for CT Scanning

CT Scan – Cylindrical Impact

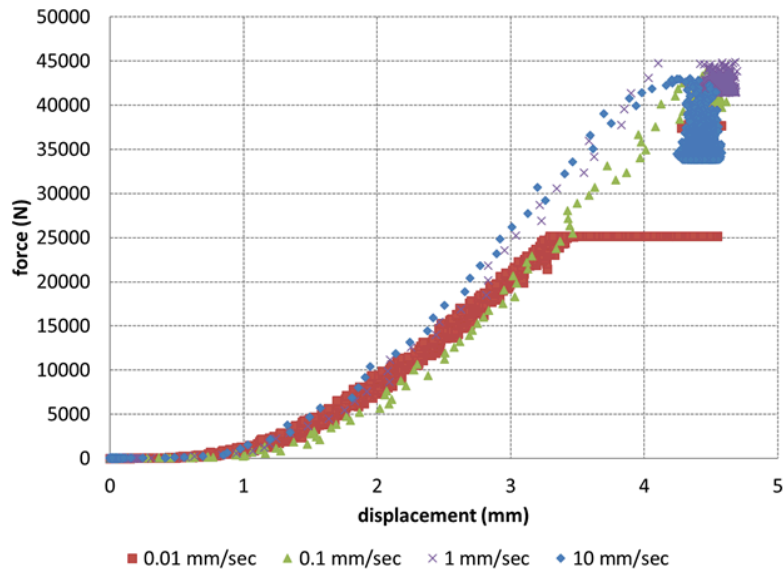
Compression at edges/Point of impact

Compression from buckling

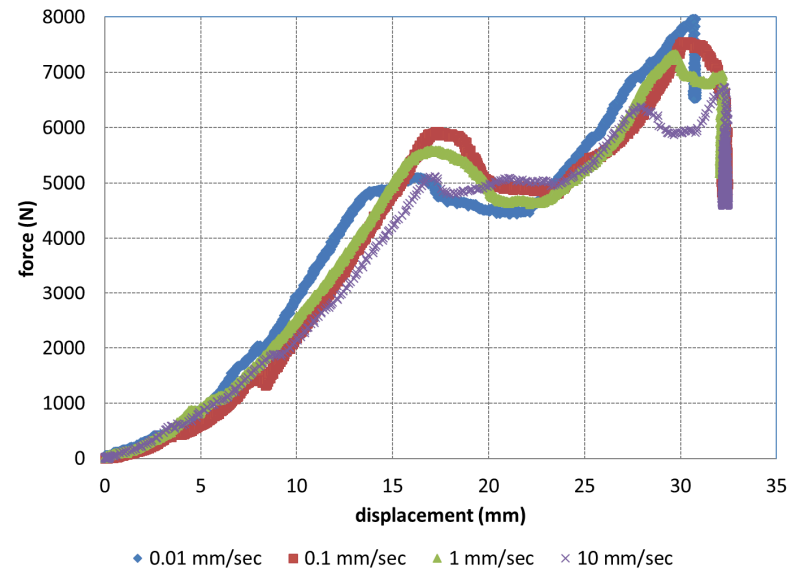


Separation of electrode layers

Comparison of single cells –direction of impact and rate

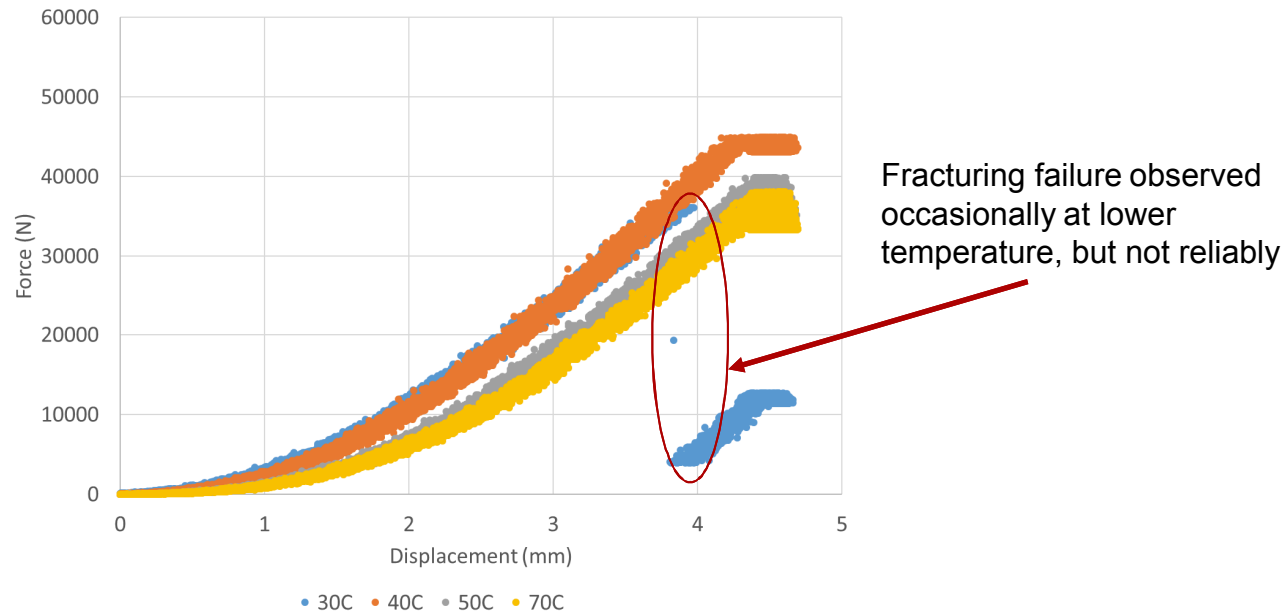


Face impact – failure through electrode layer compression



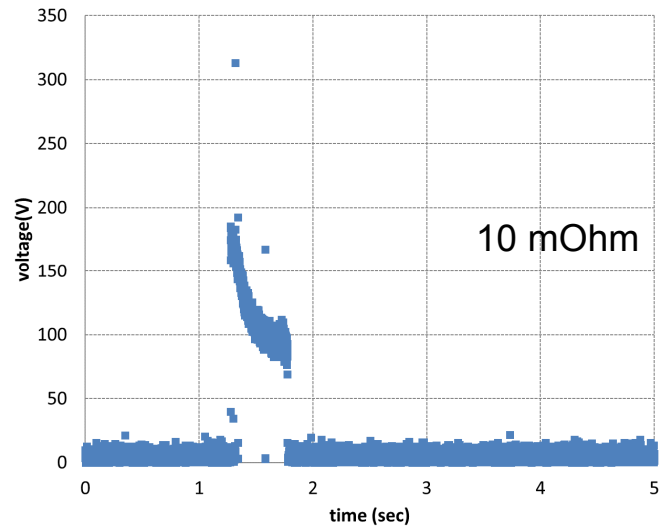
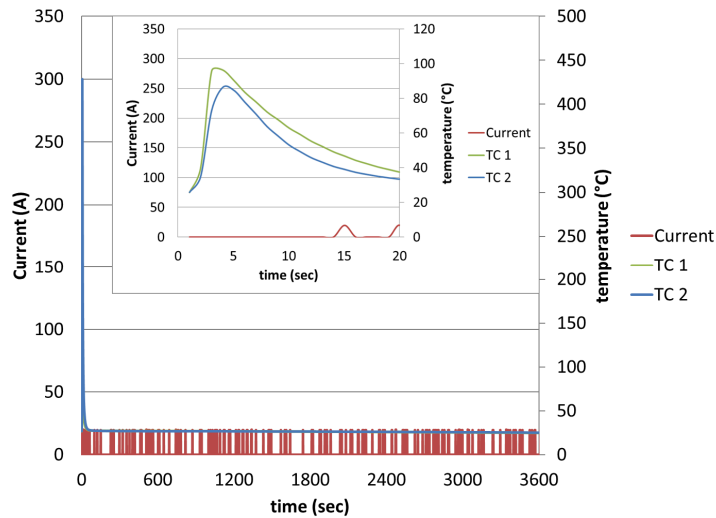
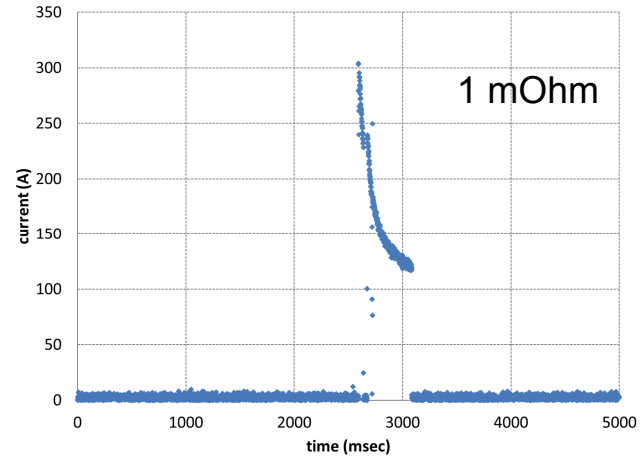
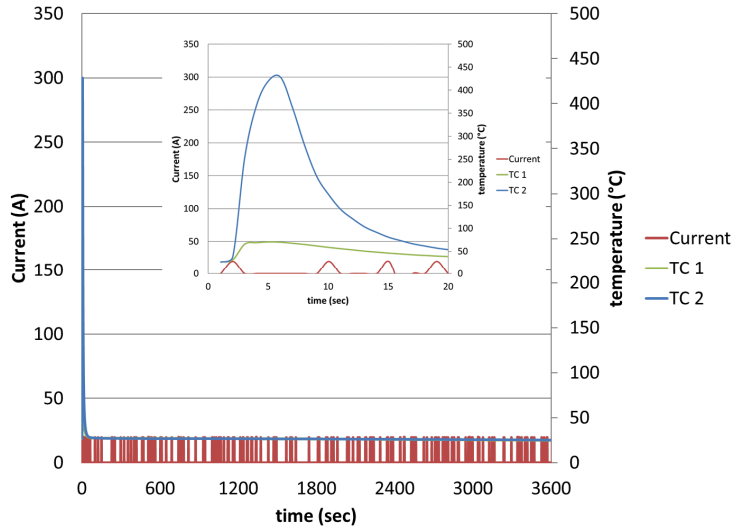
Edge impact – failure through buckling of electrodes

Temperature impact of electrode layer compression



- Test performed into face of cell – force applied perpendicular to electrode layers
- 0.1 mm/Sec deformation rate
- Some reduced resistance to compression observed , particularly above 50 °C

1 mOhm and 10 mOhm short behavior comparison



Summary

- CT Scanning of edge impacts shows cell failure during edge impacts likely to occur from multiple points of failure. Localized compression of electrodes, electrode separation
- Comparison of strain rates shows limited changes in both orientations
- Increasing temperature shows some reduced resistance to compression, particularly above 50 C.
- CT scan of cells in compression to be performed
- Three point bend test apparatus being installed for single cell test analysis of both fully charged cells and discharged cells

Acknowledgements

CAEBAT Program

- David Howell (DOE)
- Brian Cunningham (DOE)
- Ahmad Pesaran (DOE)
- Shriram Santhanagopalan (NREL)
- Kandler Smith (NREL)
- Chris Orendorff
- Leigh Anna Steele
- Chris Grosso
- Jerry Quintana
- Scott Spangler
- Loraine Torres-Castro
- June Stanley



Battery Safety R&D Program at Sandia: http://energy.sandia.gov/?page_id=634

ECS Interface Issue on Battery Safety: http://www.electrochem.org/dl/interface/sum/sum12/if_sum12.htm