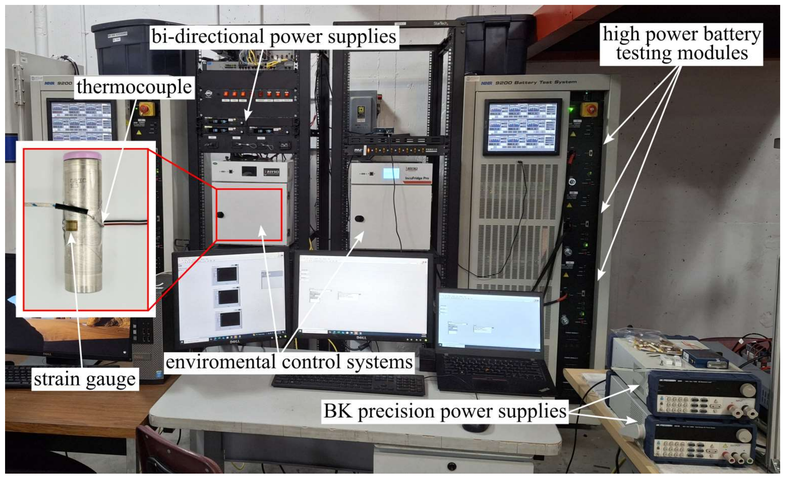
100 kW Battery Lab at the University of South Carolina

Cebastione Bailey[1], George Anthony[1], Connor Madden[1], Jarrett Peskar[1], Austin R.J. Downey[1,2]

University of South Carolina, Department of Mechanical Engineering[1]
University of South Carolina, Department of Civil Engineering[2]

Our Lab



General battery lab set up

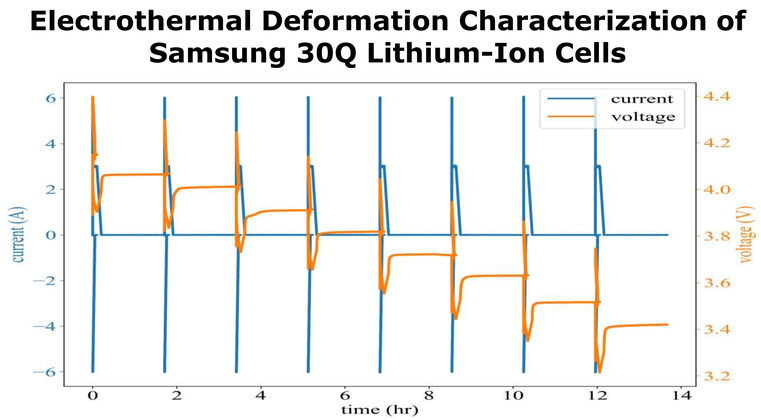
Battery Lab Capabilities

Power & Battery Testing:
- IT-M3412 (3x): 60 V, 30 A, 200 W - *For rapid, precise small-cell testing*
- NHR 9200 Systems:
  - 4960 Modules: 600 V, 40 A, 12 kW (x6) - *For high voltage modules and pack testing*
  - 4912 Modules: 120 V, 200 A, 12 kW (x3) - *For high current modules and pack testing*

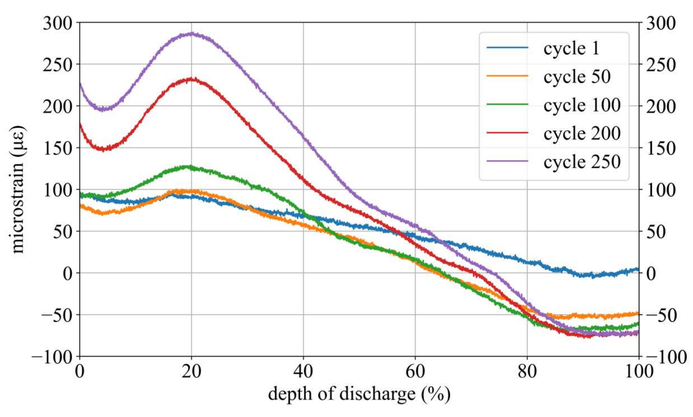
Thermal Chambers
- Binder KB 115: −10 °C to 100 °C - *customized to allow for battery venting in temperature-controlled conditions*
- Incufridge Units328P (28 L), 365P (65 L ×2): 4 °C to 75 °C, ±0.5 °C - *Controlled thermal environments*

Instrumentation
- Strain Gauges & Thermocouples *Real-time mechanical and thermal data*
- Impedance Measurements - *Track internal resistance changes to assess State of Health (SoH)*

Public Data Sets

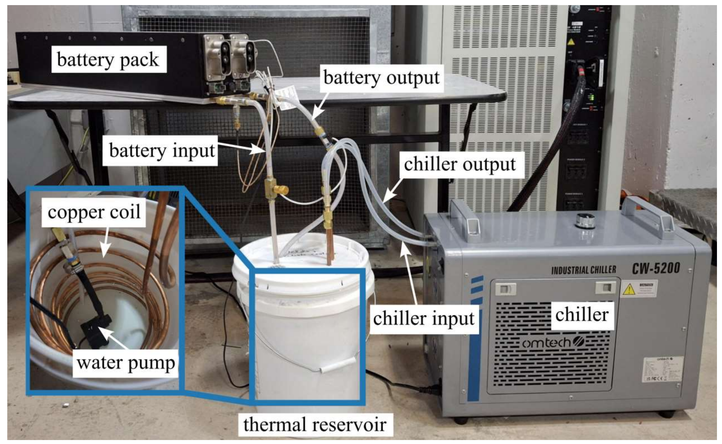


github.com/ARTS-Laboratory/dataset-electrothermal-deformation-characterization-for-samsung-30Q-cell



github.com/ARTS-Laboratory/dataset-cycling-with-strain-monitoring-for-samsung-30Q-cell

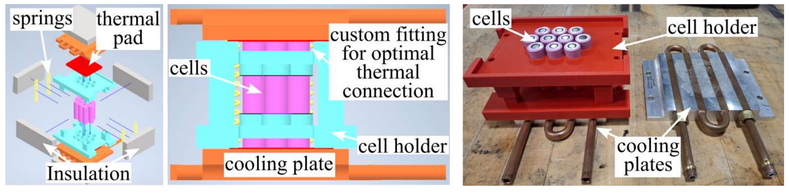
Liquid-Cooled Battery Pack Testbed



Testbed for liquid cooled battery backs with chiller to enable control of battery thermals.

Open-Source Battery Pack

- Battery Pack for studying Heat Dispersion: Once data is gathered on the heat dispersion it will be used to create an emulator for future battery packs without having to create a physical model
- Cycling Tests and strain collection: These tests are run to predict State of Charge, and better understand intercalation for predicting battery behavior
- Building and comparing data driven along side physics-based models for battery state prediction
- Liquid cooled battery packs



(a) (b) (c)

The lab's open-source battery pack being developed, showing, (a) exploded view of internal in the battery pack, (b) compact view showing the necessary contact between battery and cooling plate, and (c) key components

UNIVERSITY OF South Carolina