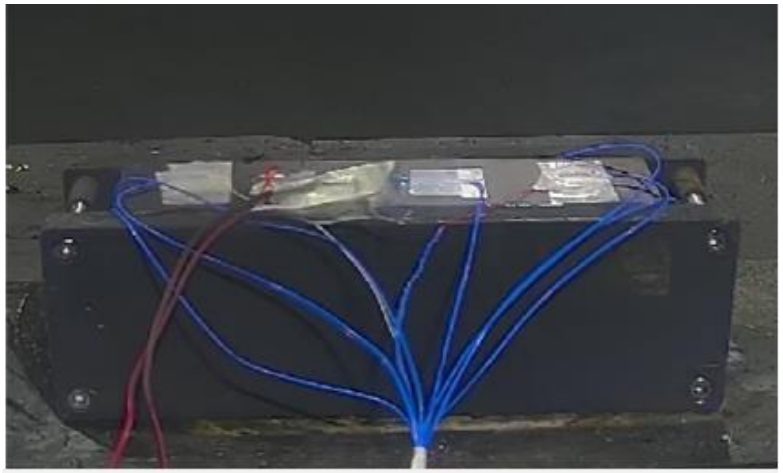
TR and TP Test by Internal Heating

China

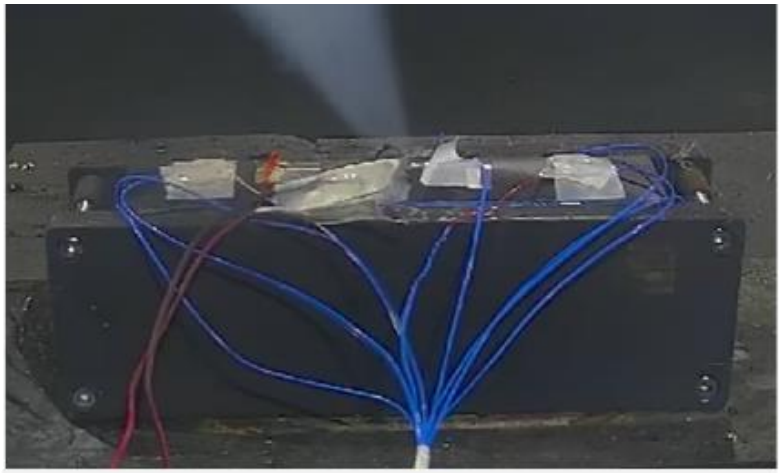
2023.6

TR test on cell

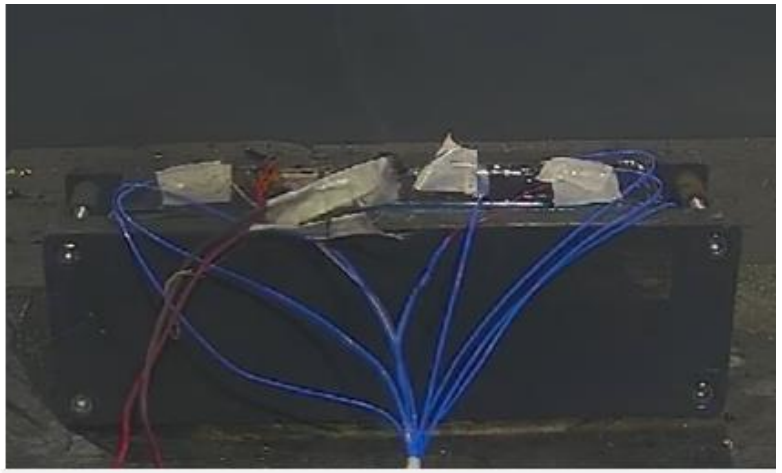
- Cell Design: 173Ah LFP_100%SOC
- Heater Information：30*30mm_~600W



Start to trigger cell



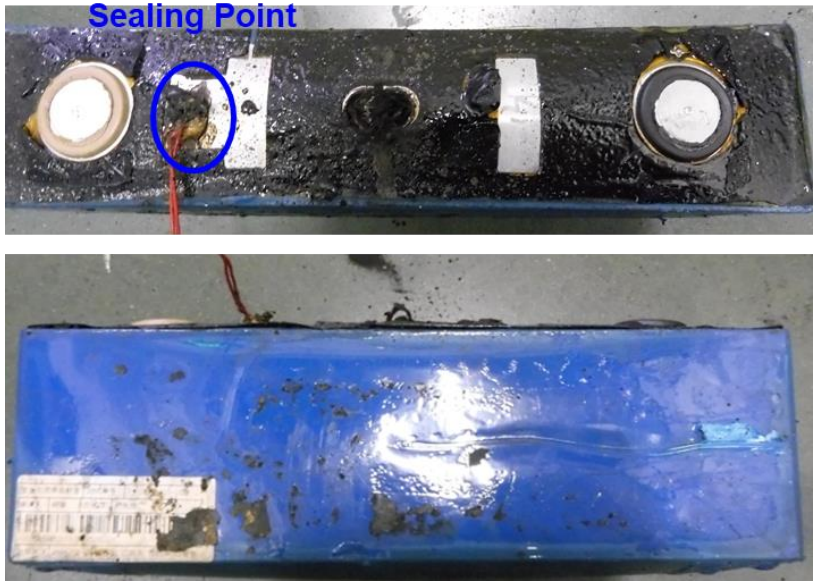
Cell thermal runaway (Degassing)

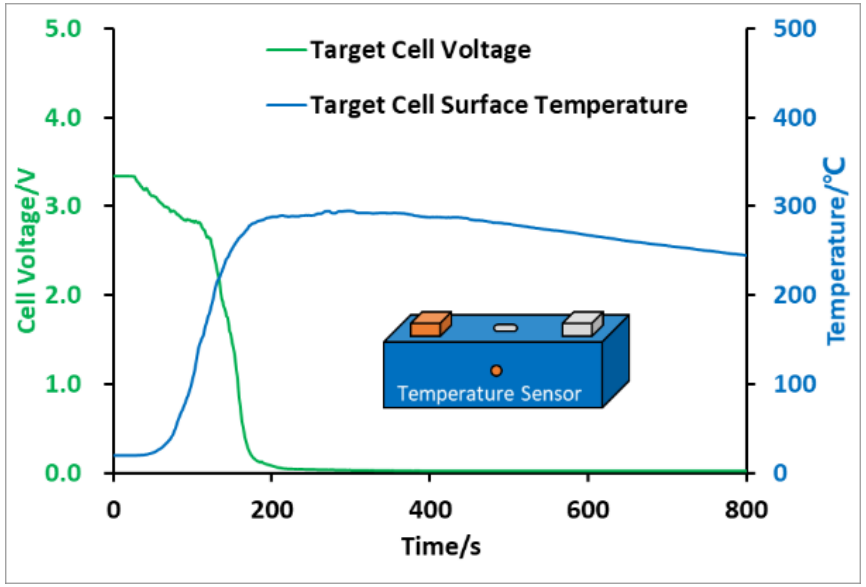


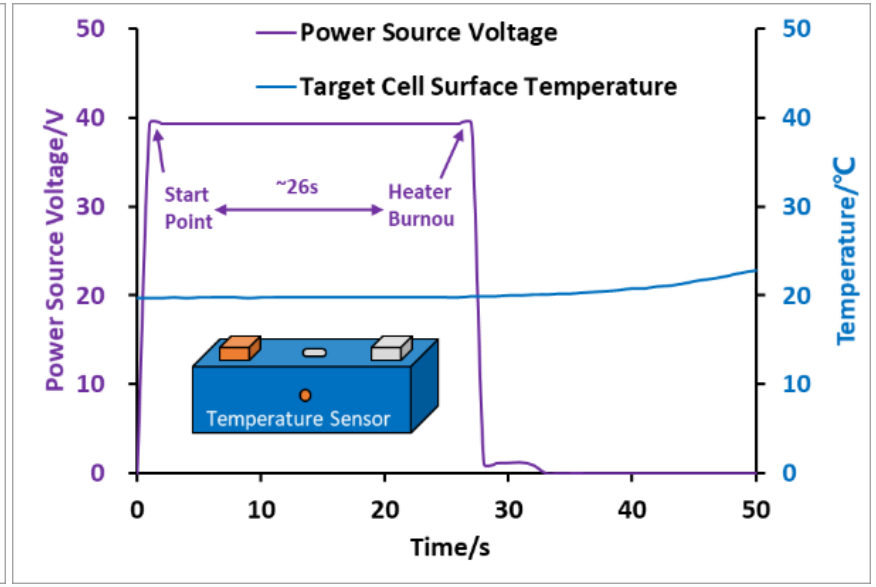
After Test

TR test on cell

- It takes about 26s to trigger the cell into thermal runaway.
- Before cell thermal runaway, there is no significant rise of the temperature of cell surface(≤0.3℃).
- There is no abnormal damage of the cell wall.







TP test on pack

- Cell Design: 260Ah NCM_100%SOC；
- Heater Information：30*30mm_~300W

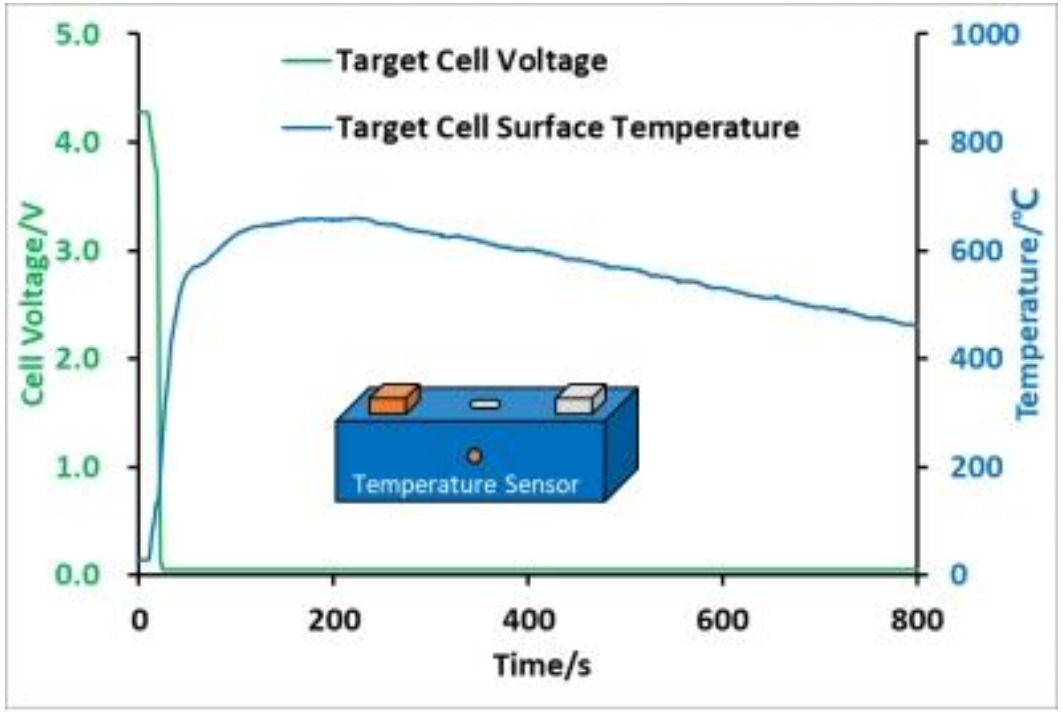
Start to trigger cell

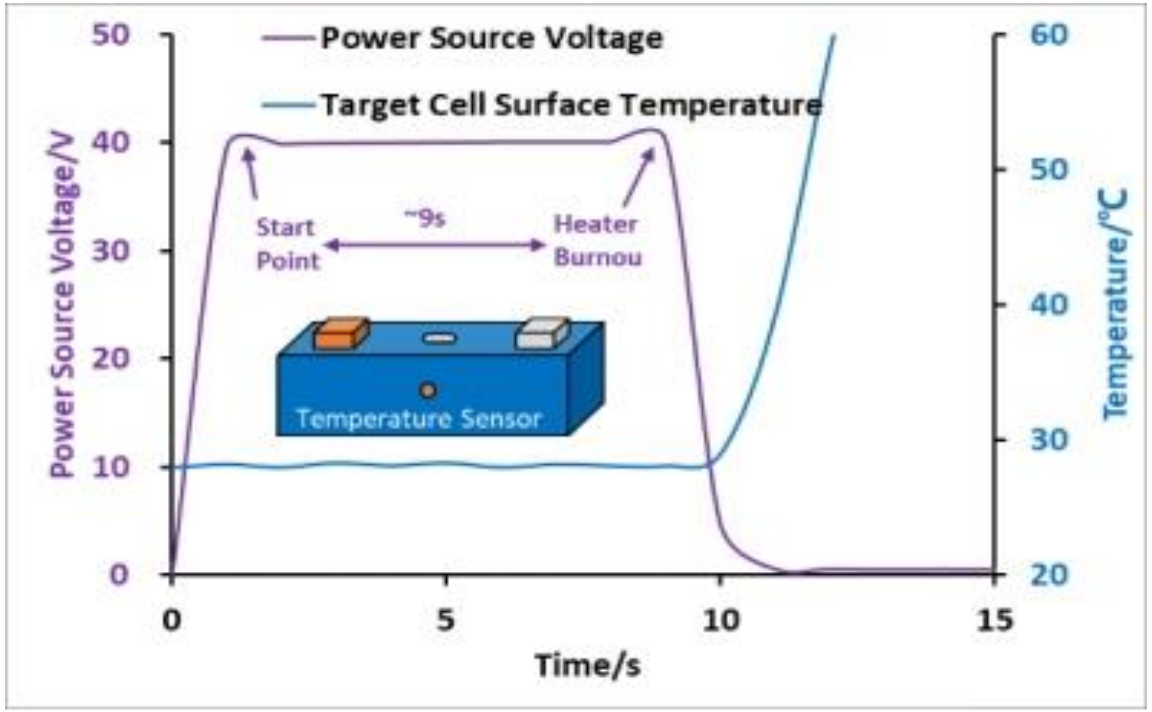
Cell thermal runaway (Degassing)

After Test

TP test on pack

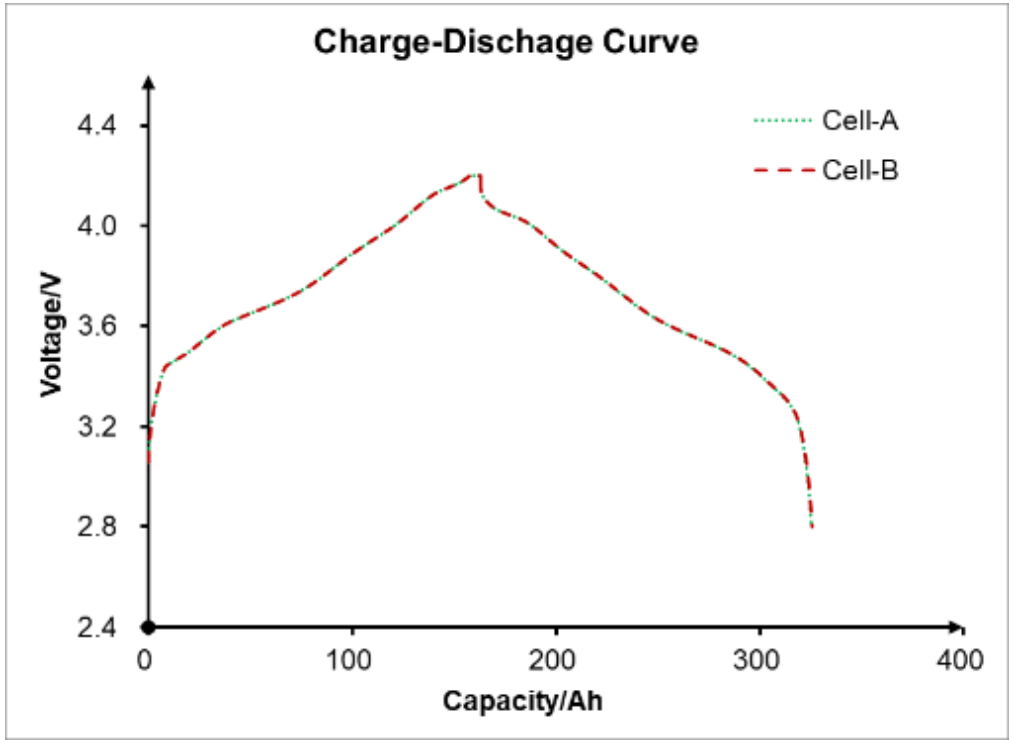
- It takes about 9s to trigger target cell into thermal runaway.
- Before cell thermal runaway, there is no significant rise of the temperature of cell surface (≤0.3℃).
- After cell thermal runaway, there is smoke and gases released, but no thermal propagation.





Influence of Cell Assembled

- According to the results of capacity test and DCR test, it shows that there is a good consistency between the charge-discharge curves of Cell-A and Cell-B. It means that there is no significant change of cell status and energies of single cells.
- The insertion of heater in the cell has little impact on its performance.



Cell	Capacity/Ah	DCR/mΩ
Cell-A (Normal Design)	Base	Base
Cell-B (Special Design)	<1% change	<5% change

Summary

- Internal heating can trigger thermal runaway of single cells, and thermal propagation test at pack level is feasible.
- Whether it is external heating or internal heating, the testing methods and layout at the vehicle level are almost the same. Therefore, although no test cases at the vehicle level are provided, the battery pack level test case is sufficient to prove the feasibility of internal heating in the test at the vehicle level.
- The heating plate embedded inside the cell has little impact on the performance of the cell.
- We have provided a proposal for internal heating method.

Thank You