The influence of different gas/smoke sensor positions on emission test results

China
2023.06

Quick Review

1.Standardization requirements of GTR

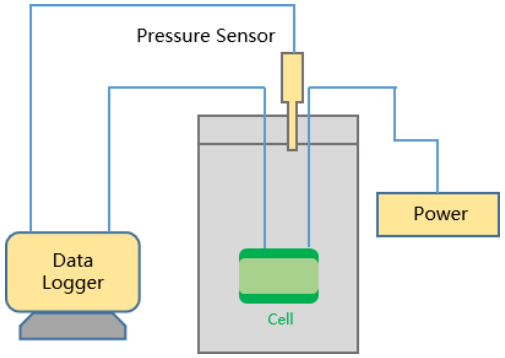
- Phase 1　Several ideas from Japan, JRC and OICA were discussed but no suitable method. It was not possible to research and analyse this in Phase 1. Therefore, it will be considered in Phase 2
- Phase 2　A unified, repeatable, easy to implement method that can evaluate the impact of battery gas production on occupants.

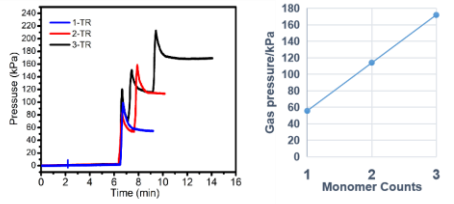
2.Establish a multi-level emission test method

- Cell→Module→Pack→Vehicle
- Test device & Trigger Method & Collection Method & Analysis

3.Research progress of China

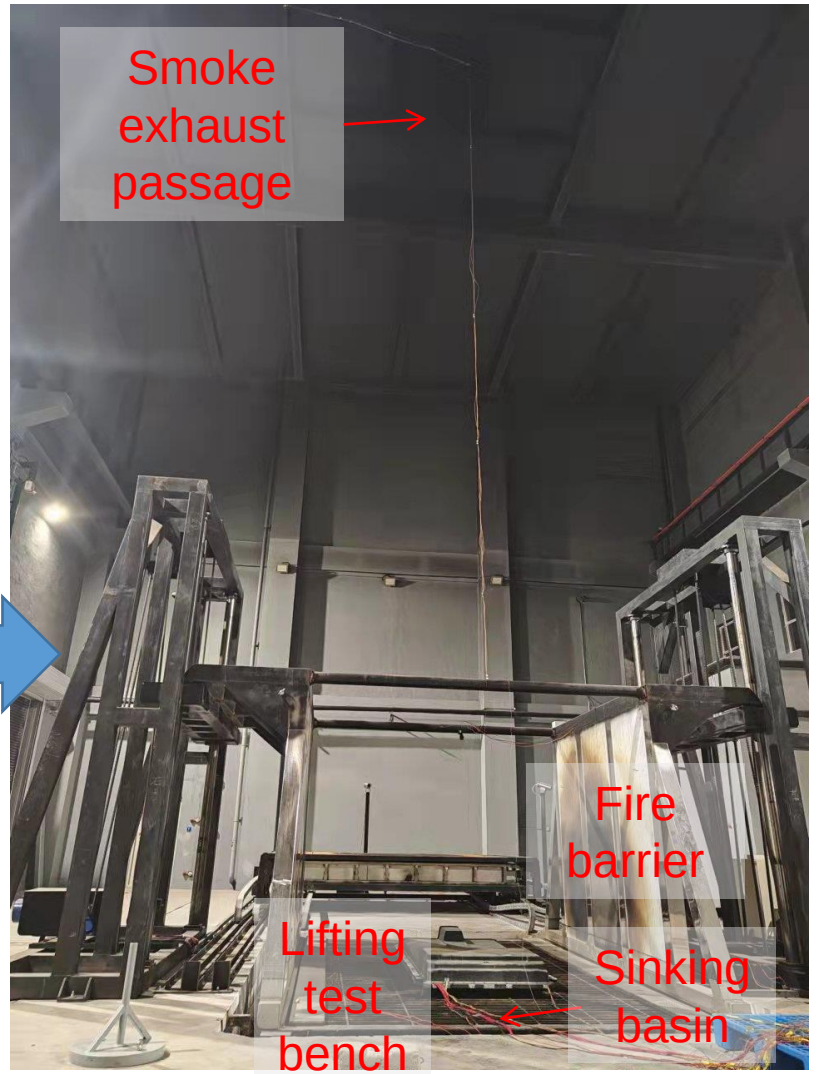
- Cell Level：The test method on cell level emission test was established，more data required
- Module Level: cell result multiplication (CRM) method is preliminarily explored
- Pack Level: Distribution and indicator threshold of emission sensors at Pack and above levels
- Vehicle Level: Established vehicle level emission testing for LFP and NCM chemistry





ΔP(kPa)	1st	2nd	3rd	Sum
single	55.53	/	/	55.53
double	53.19	60.78	/	113.97
triple	67.71	50.65	53.41	171.77

Emission Test Building



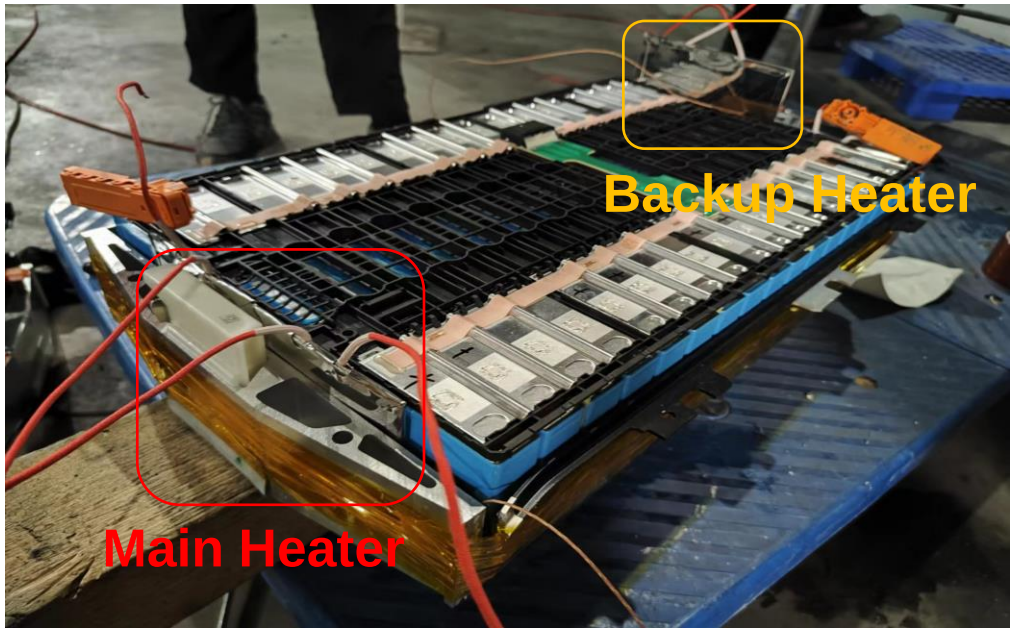
Battery Information

Chemistry:NCM

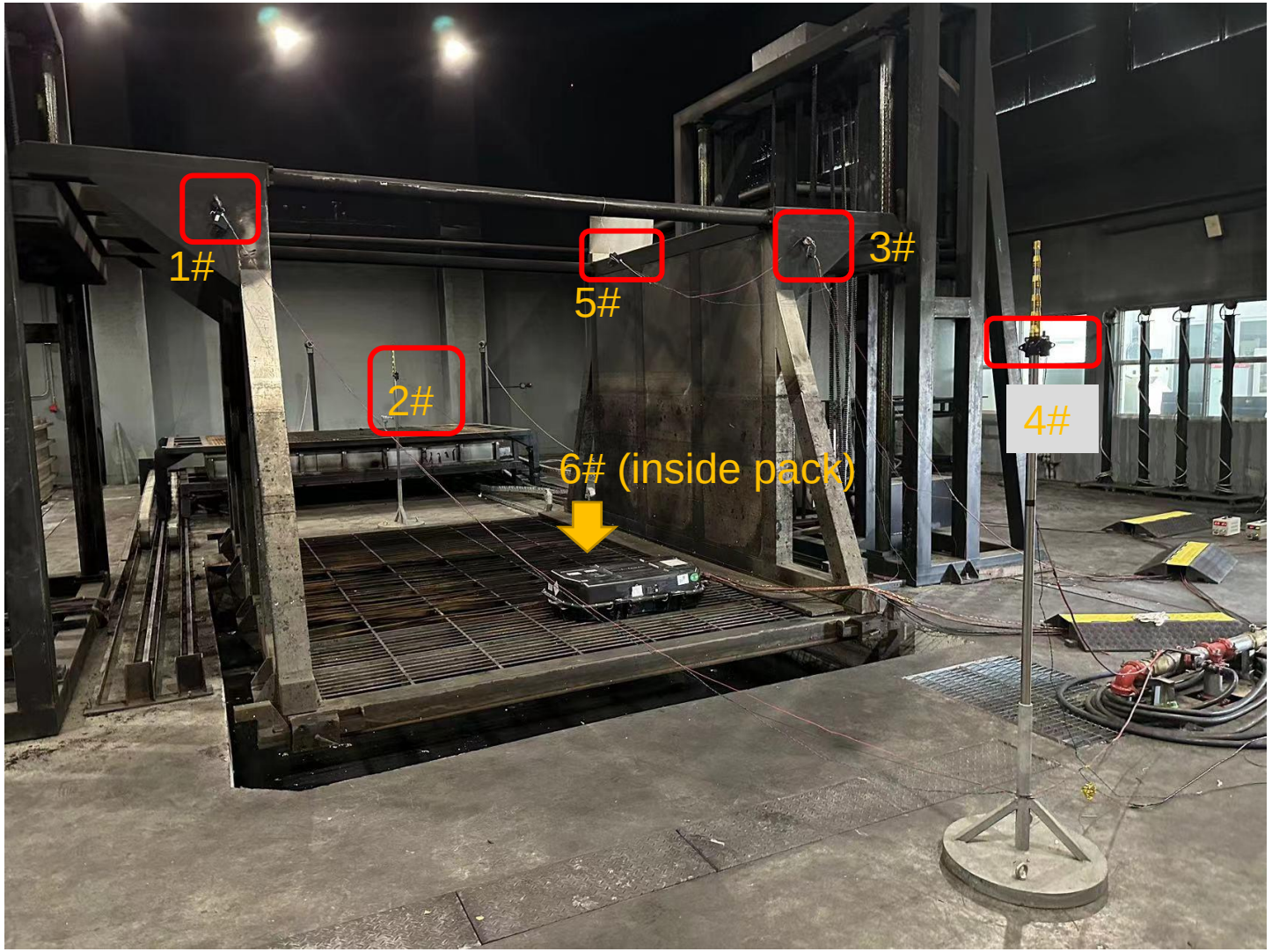
Structure:18 battery cells in series

SOC: 100%

Initiation method: 300W constant power heating

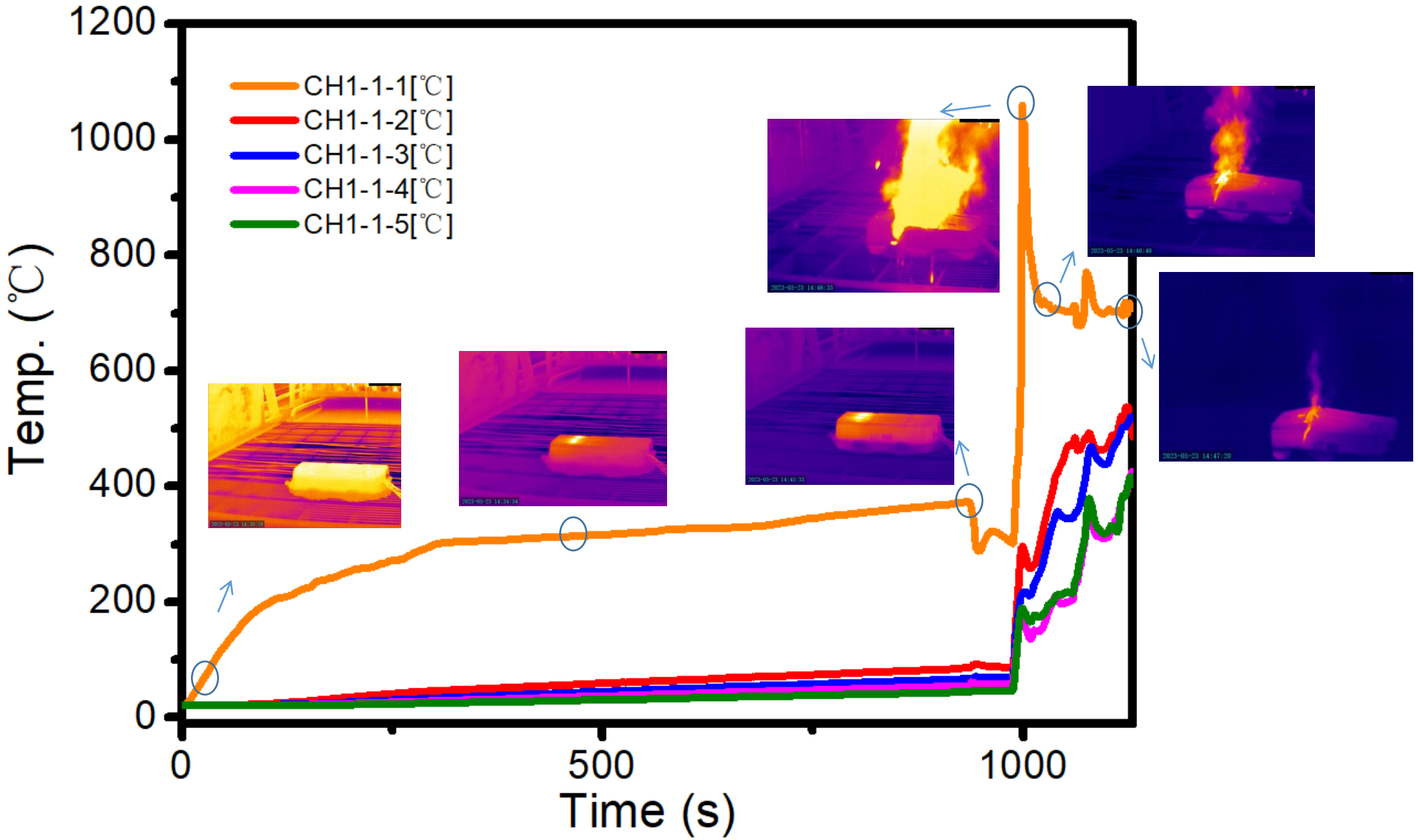


Test Preparation

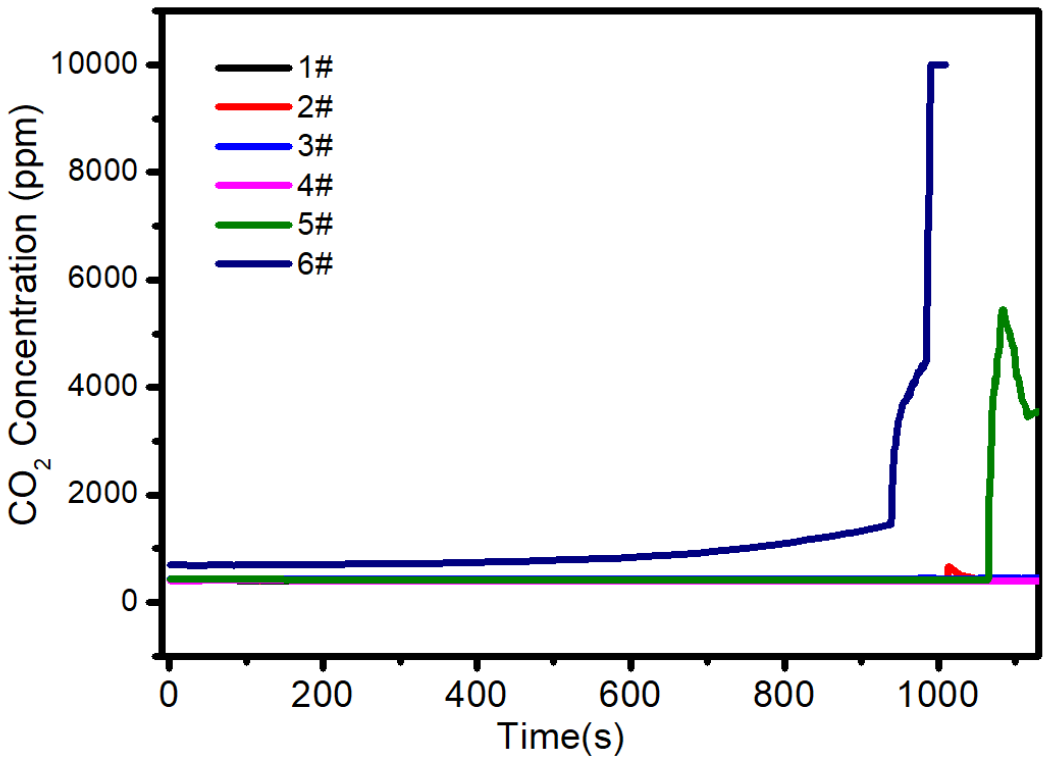


- Six sets of CO/CO2/PM 2.5 sensors were placed in different positions on the test bench
- Sensors 1 # -4 # are placed around the battery pack
- Sensor 5 is placed 2.1m above the battery pack
- The 6 # sensor is placed inside the battery pack

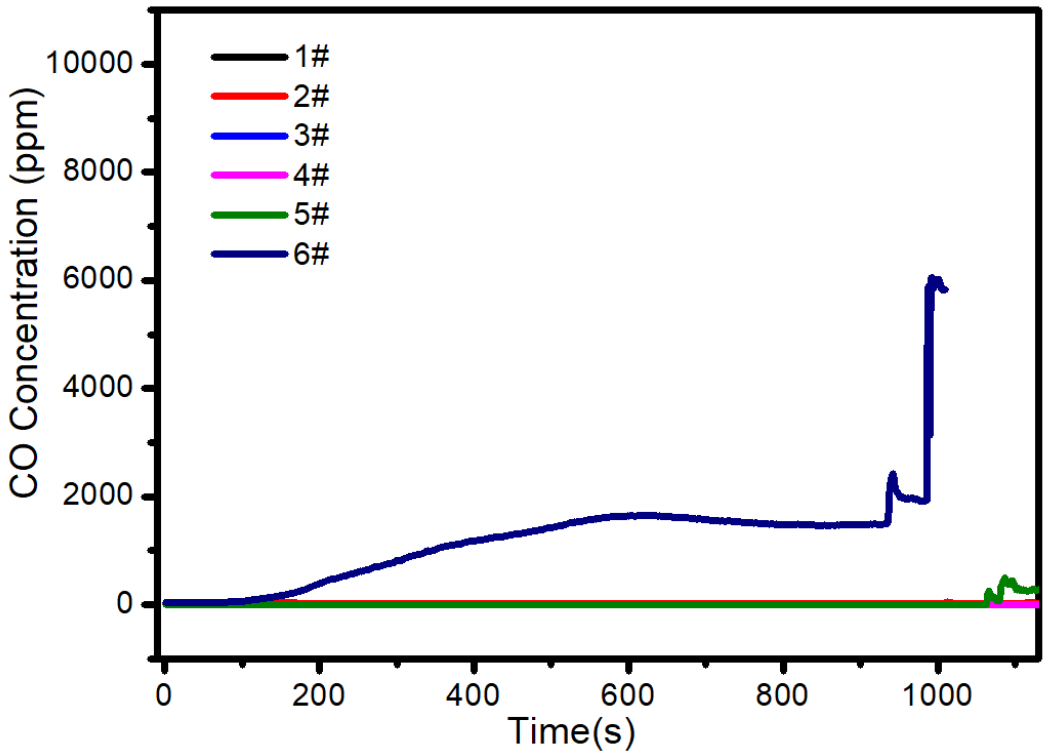
Test process



CO2/CO test results



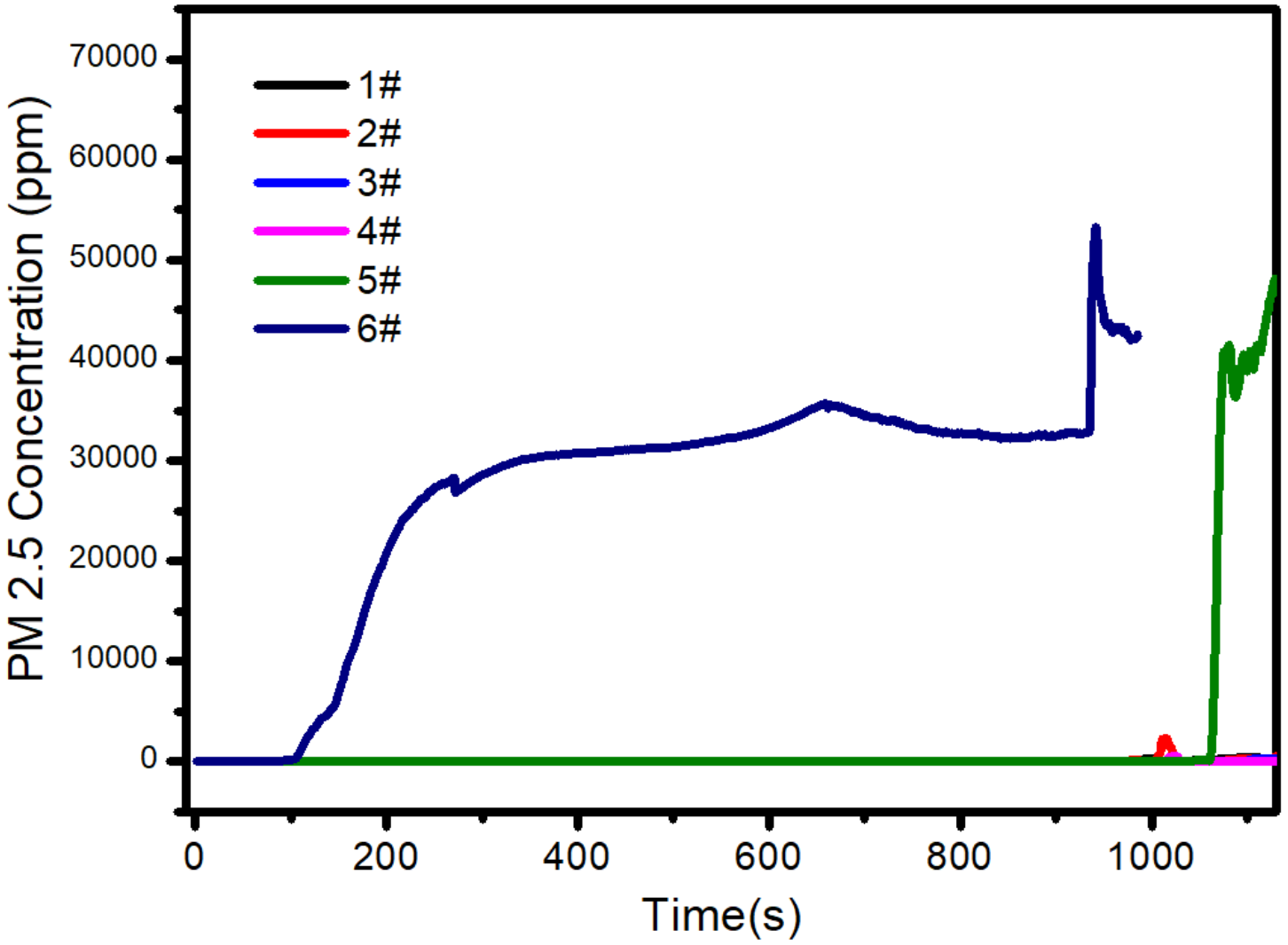
- 6 # significantly increased from about 400s
- After flame appeared in the battery pack, there was a significant increase in the value of 5#



- 6 # significantly increased from about 200s
- After flame appeared in the battery pack, the CO Concent. increase of 5# was not significant

- The internal sensor was burned at about 950s

PM 2.5 test results



- 6 # significantly increased from about 100s, burned at about 950s
- After flame appeared in the battery pack, there was a significant increase in the value of 5#

Summary & Next Plan

- Sensors inside pack can better monitor battery emissions, while methods such as thermal prevention or insulation need to be considered to make them work more consistently
- Placing sensors on the top of the battery pack is more effective than surrounding it
- PM2.5 and CO is more suitable for monitoring the early failure behavior of battery TR
- The next step will be to conduct similar tests at the vehicle level, especially comparing the test results at different positions in the passenger compartment