CSA GROUP

Laboratory Test Data – UL 9540A Checklist and Test Result (Cell Level)

ORIGINAL TEST DATA

The results relate only to the items tested.
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Master Contract:	/	Model:	NaCP71173208-160E3	Page number 1 of 35
Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Standard(s): UL 9540A:2025, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 5thEdition, March 12, 2025

Testing Laboratory Name:	CCIC-CSA International Certification Co., Ltd. Kunshan Branch
Address:	2F-1, Building C12, No 555 Dujuan Road, Kunshan Economic & Technical Development Zone, Kunshan, Jiangsu 215331, China
Testing Program:	**Custom Test:** Cover Letter ☒, Testing Only ☐

If tests were performed at another facility, then described below:

Testing Laboratory Name:	N/A
Address:	N/A
Facility Qualification Number:	N/A

	As above / or describe otherwise
Customer:	Highstar Sodium Battery（guangdong）Co.,LTD
Address:	Guangdong,China,No.8 Chuyun Street, Baiyun District, Guangzhou,

Tested By: Tailton Li/Lucas Hou
Name, Title

Tailton Li/Lucas Hou 2026-09-09 to 2026-10-10
Signature *Date (YYYY-MM-DD)*

☒ **Reviewed by:** Wilson He(T)/Judy Guo, Certifier
☒ **Witnessed by:**
Name, Title

Wilson He(T)/Judy Guo 2026-09-09 to 2026-10-10
Signature *Date (YYYY-MM-DD)*

Version6.1 : 2025-03-12

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Cell Level Test Summary	
Manufacturer:	Highstar Sodium Battery (guangdong) Co.LTD
Brand name / Trademark:	N/A
Model number:	NaCP71173208-160E3
Nominal cell voltage, (V)	3
Cell capacity, (Ah)	160
Cell chemistry:	Na-ion
Physical format of cell:	Prismatic
Approximate dimension, (mm)	207.2±0.5*173.7±0.5*71.7±0.8mm, H*L*T
Mass, (g)	4650±300
Cell certification available? (Yes/No)	NO
Standard(s) used to certify product:	/
Certification organization name and its file number:	/
Method used to initiate thermal runaway:	Film Heater
Average temperature at which cell first vented excluding gas collection sample, (°C)	137.0
Average temperature prior to thermal runaway excluding gas collection sample, (°C)	141.0
Location of maximum temperature:	Cell largesurface not covered by heater
Flammable gas generation, (Liter)	93.1
Total gas generation, (Liter)	137.1
Lower flammability limit (LFL) at ambient temperature (25 ± 5°C), (%)	5.9
Lower flammability limit (LFL) at average gas vent temperature, (%)	5.5
Burning velocity, (cm/sec)	58.125
Maximum pressure P_{max}, (MPa)	0.607

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Cell Level Test Summary

Gas composition:

Gas Component	Gas Type	Gas Volume in percentage (%)
Methane	CH_4	3.679
Ethane	C_2H_6	2.065
Ethylene	C_2H_4	4.280
Propane	C_3H_8	0.434
Propylene	C_3H_6	8.357
Isobutane	C_4H_{10}	0.011
Butane	C_4H_{10}	0.105
Acetylene	C_2H_2	0.026
1-butene	C_4H_8	0.042
Isobutene	C_4H_8	0.083
Isopentane	C_5H_{12}	0.013
n-Pentane	C_5H_{12}	0.018
1-pentene	C_5H_{10}	0.003
Hydrogen	H_2	28.666
Carbon Monoxide	CO	9.712
Carbon Dioxide	CO_2	42.506
Total	---	100

Additional Information:	N/A

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Performance - Cell Level Test		
Requirement	**Comments**	**Verdict**
Thermal runaway cannot be induced in the cell.	Thermal runaway induced on cell using film heater	F
Cell vent gas does not present a flammability hazard when mixed with any volume of air, as determined in accordance with ASTM E918 at both ambient and vent temperature.	Cell presented flammability hazard when tested in accordance with ASTM E918, module and unit level test required.	F
Summary of Result: Module level testing is required based on above performance condition indicated in Section 7.7 of UL 9540A 5th Edition.		

Possible test case verdicts:

- Test case does not apply to the test object: N/A
- Test object does meet the requirement: P (Pass)
- Test object does not meet the requirement: F (Fail)

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Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Clause	Requirement + Test	Result - Remark	Verdict
Construction			
5	**General**	---	---
5.1	**Cell**	---	---
5.1.1	Cell chemistry:	Na-ion	---
	Physical format of cell:	Prismatic	---
	Nominal voltage rating, (V)	3	---
	Nominal capacity rating, (Ah)	160	---
	Approximate dimension, (mm)	(71.7±0.8)*(173.7±0.5)* (207.2±0.5)	---
	Mass, (g)	4650±300	---
5.1.2	Cell certification available? (Yes/No)	NO	---
	Standard(s) used to certify product:	/	---
5.1.3	Cell Level Test Report	/	---
Performance			
7	**Cell Level**	---	---
7.1	**General**	---	---
7.1.1	Establish effective method by forcing a cell into a thermal runaway in a repeatable manner.	Test Method: External heating	P
	Vent gas composition was gathered and analyzed.	See Table 4 for details	P
	Cell temperature was monitored to determine the temperature when cell vents.	See Table 3 for details	P
	Cell temperature was monitored to determine thermal runaway as defined in UL 9540A 5th Edition.	See Table 3 for details	P
7.2	**Sample**		---
7.2.1	Prior to testing, cell samples were conditioned for minimum 2 charge (100% SOC) - discharge (Specified end of discharge voltage) cycle as per manufacturer specified method.	See Attachment 2 for details	P
	Cells were functional after minimum 2 charge discharge cycle.	Confirmed	P
	During conditioning a relationship between open circuit voltage and SOC was determined through measurement of voltage and SOC.	Confirmed	P
	Ambient temperature during cell conditioning.	See Table 2 for details	P

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.2	The tested cells had 100% SOC at the start of the test. The samples were allowed to stabilize for a minimum of one hour and a maximum of 8 h before the start of the test.	See Table 2 for details	P
7.2.3	Cells with flexible laminate casings were constrained during test in manner that simulate constraint in the BESS module to prevent excessive swelling during test.	Prismatic cells with fixture for constraint during test.	P
7.3	**Determination of thermal runaway methodology**		**---**
7.3.1	General	See below	P
7.3.1.1	Ambient temperature during cell testing.	See Table 3	P
7.3.1.2	Propensity of cell to exhibit thermal runaway demonstrated by externally applied film heater.	Heater type: Film heater rated 900W Heater dimension (mm): 190*160 Number of heaters used: Two heaters, one fixed on each large surface	P
	A surface heating rate of 4° C (7.2° F) to 7° C (12.6° F) per minute shall be applied to the cell.	☒ 4.5 ° C/min	P
	Maximum surface temperature endpoint criteria was determined based on cell design and cell chemistry.	Considered	P
	Thermal runaway method used, when external heating with flexible heater was not able to cause the cell to exhibit thermal runaway.	☐ Mechanical: ☐ Electrical Stress: ☐ Alternate heating sources: ☐ Other(explain):	N/A
7.3.1.3	Detail of thermal runaway test method when another method used as reference in 7.3.1.2.	Film heater was used for testing	N/A
7.3.1.4	Monobloc battery such as lead acid or nickel cadmium, was treated as individual cell for this testing.	Na-ion cell	N/A
7.3.1.5	Surface temperature at which internal short circuiting within the cell will occur that could lead to thermal runaway.	See below	N/A
	Surface temperature hold point. For lithium ion cell, hold point was between 5°C (9°F) and 15°C (27°F)	The cells were heated until the thermal runaway achieved. According to the Certification Requirement Decision: Test Method for Evaluating	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	greater than the melting temperature of the cell separator material as determined from differential scanning calorimetry (DSC) data of the separator in accordance with UL 2591 (UL 746A).	Thermal Runaway Fire Propagation in Battery. Holding temperature was not utilized during the test and the cell was continuously heated until the thermal runaway achieved.	
	If thermal runaway is not achieved at holding temperature after period of 4h, heating rate according to 7.3.1.3 was reestablished.	See above	N/A
7.3.1.6	If cell is susceptible to thermal runaway by external heating, cell was heated until thermal runaway has occurred.	Confirmed, film heater method used for testing	P
	If cell is not susceptible to thermal runaway by external heating, another method included in 7.3.1.2 was used.	See above	N/A
	If using another external heating method, temperature ramp and maximum surface temperature as outlined in 7.3.1.2 and 7.3.1.5 was used.	See above	N/A
7.3.1.7	Cell's exterior surface temperature was measured continuously, averaging over every 60 seconds	Confirmed	P
	The maximum of these averages was documented for each thermocouple location.	Confirmed	P
	Location of thermocouple during test.	☒ Under the heater that is placed on the cell surface to measure the surface heating rate T1, T2 ☒ Cell surface near the heater to measure the temperature of cell surface and to measure the temperature of cell surface at the time of venting. This thermocouple was not covered by the heater. T5, T6 ☒ Cell vent area. T4 ☒ Other(explain): Near positive cell terminal: T3 Ambient temperature: T7 See Figure 5~9 for details	P
7.3.1.8	The temperature at which the cell case vents due to internal pressure rise.	Confirmed	P

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Clause	Requirement + Test	Result - Remark	Verdict
	The thermocouple located below the heater film at the center of the cell surface is used for this measurement.	Cell surface near the heater to measure the temperature of cell surface and to determine the temperature of cell surface at the time of venting. This thermocouple was not covered by the heater.	N/A
	If using the other cell abuse methods, the thermocouples would be located at the same locations on the cells as noted in 7.3.1.7.	See above	N/A
7.3.1.9	The temperature at the onset of thermal runaway was documented.	See Table 3 for details	P
	Onset of thermal runaway was determined by the point at which the rate of change of the surface temperature of the cell exceeds that of the externally applied heat input if utilizing the external heater method.	Confirmed	P
	In cases where cell venting may occur first, cell was heated continuously until thermal runaway occurs.	Confirmed, heating continued until cell thermal runaway achieved	P
	With other stress methods, it was necessary to continue applying the stress such as mechanical or electrical stress until onset of thermal runaway occurs.	External heating method used	N/A
	Separator information was available or at the manufacturer's discretion, the thermal ramp was conducted continuously without a hold point until thermal runaway.	Thermal ramp was conducted continuously without holding point considered	P
7.3.1.10	When using methods other than the heater method, the stresses (i.e. electrical or mechanical) were applied to the cell until thermal runaway occurs.	External heating method used	N/A
7.3.1.11	If the cell exhibits thermal runaway behavior (using any method), 3 additional samples were tested using the same method and exhibit thermal runaway to demonstrate repeatability.	See Table 3 for details	P
	The vent temperature and thermal runaway onset temperatures were averaged over the tested samples (Excluding the gas vent capture sample).	See Table 3 for details	P

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Clause	Requirement + Test	Result - Remark	Verdict
7.3.2	Flow battery thermal runaway determination tests	Na-ion cell	N/A
7.4	**Cell vent gas composition test**	**---**	**---**
7.4.1	Cell vent gas was generated and captured by forcing a cell into thermal runaway with the methodology developed in 7.3, inside a pressure vessel, which is large enough to accommodate cells, but not so large as to influence measurement of the gas composition.	Confirmed: 98L pressure vessel used for testing.	P
	The test was initiated with an initial condition of atmospheric pressure and less than 1% oxygen by volume.	See Table 4 for details	P
	The initial atmospheric conditions prior to testing was noted.	See Table 4 for details	P
7.4.2	Cell vent gas composition was determined using Gas Chromatography (GC)	Confirmed	P
	Hydrogen gas was measured with a sensor capable of measuring in excess of 30% by volume.	Confirmed	P
	The initial atmospheric conditions prior to testing was noted.	See Table 4 for details	P
7.4.3	The lower flammability limit of the cell vent gas was determined in accordance with ASTM E918, testing at both ambient and cell vent temperatures.	See Table 4 for details	P
7.4.4	The burning velocity of the cell vent gas was determined in accordance with Annex in ISO 817.	See Table 4 for details	P
7.4.5	The P_{max} of the cell vent gas was determined in accordance with EN 15967.	See Table 4 for details	P
7.5	**Off gas composition for flow battery systems.**	**---**	**---**
7.5.1	The off gas composition from the flow battery testing of 7.3.2 shall be determined by conducting the test method of 7.3.2.2: 1. In a closed container and capturing the off gasses generated, and 2. By collecting the off gasses generated at vent openings and vent ducts during the overcharge and short circuit testing of 7.3.2.4	Na-ion cell	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	and 7.3.2.6 as applicable to the flow battery technology		
	Composition of these captured gases and their flammability limit shall be determined through the methods outlined in 7.4.2 and 7.4.3 at both ambient temperature and the maximum temperature measured.	Na-ion cell	N/A
7.5.2	The volume of flammable gases measured during the testing were scaled to the maximum energy reservoir for the intended flow battery system.	Na-ion cell	N/A
7.6	**Cell level test report**		
7.6.1	Cell level report include information indicated in item a) through m)	Confirmed	P
7.6.2	Flow battery report include information indicated in item a) through k)	Na-ion cell	N/A

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Table 1 – Cell charge/discharge specification			
Charging method	CC-CV	Discharging method	CC
Charge current, (A)	80	Discharge current, (A)	80
Charge cut-off current, (A)	8.15	---	---
Charge end voltage, (Vdc)	3.45	Discharge end voltage, (Vdc)	1.50
Manufacturer recommended charge temperature, (°C)	25±2	Manufacturer recommended discharge temperature, (°C)	25±2

Table 2 – Cell rest duration				
Sample Number	Final charge end time		Test start time	
	Date (YYYY-MM-DD)	Time (HH:MM AM/PM)	Date (YYYY-MM-DD)	Time (HH:MM AM/PM)
CWN260910-01#	2026-09-17	03:28PM	2026-09-17	11:08AM
CWN260910-02#	2026-09-21	05:52AM	2026-09-21	10:40AM
CWN260910-03#	2026-09-23	05:54AM	2026-09-23	01:26PM
CWN260910-05#	2026-09-28	09:27AM	2026-09-28	01:45PM
CWN260910-04#	2026-09-24	08:36AM	2026-09-24	12:26PM
Ambient temperature during cell conditioning				
Ambient Lab Temperature, (°C)		Relative Humidity, (%RH)		
25±2		26.0to39.0		

Table 3 – Determination of thermal runaway methodology					
Sample Number	Note 1				Note 2
	CWN2609 10-01#	CWN2609 10-02#	CWN2609 10-03#	CWN2609 10-05#	CWN2609 10-04#
Open circuit voltage before test, (Vdc)	3.259	3.270	3.295	3.322	3.271
Cell charge capacity after final charge cycle, (Ahr)	166.77	170.584	171.078	166.809	170.528
External film heater ramp rate, (°C/min)	4.5	4.5	4.5	4.5	4.5
Temperature at which gases are first vented, (ºC)	139.5	133.8	134.75	139.9	139.9
Temperature prior to thermal runaway, (ºC)	140.15	136.8	144	143	144
Location of maximum temperature prior to thermal runaway	Cell large surface not covered by heater	Cell large surface not covered by heater	Cell large surface not covered by heater	Cell large surface not covered by heater	Cell large surface not covered by heater
Average temperature at which gases are first vented, (ºC)	137.0				---
Average temperature prior to thermal runaway, (ºC)	141.0				---

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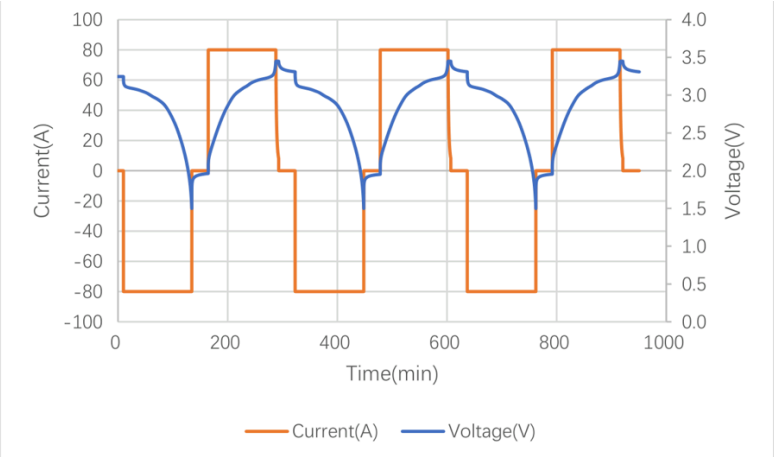
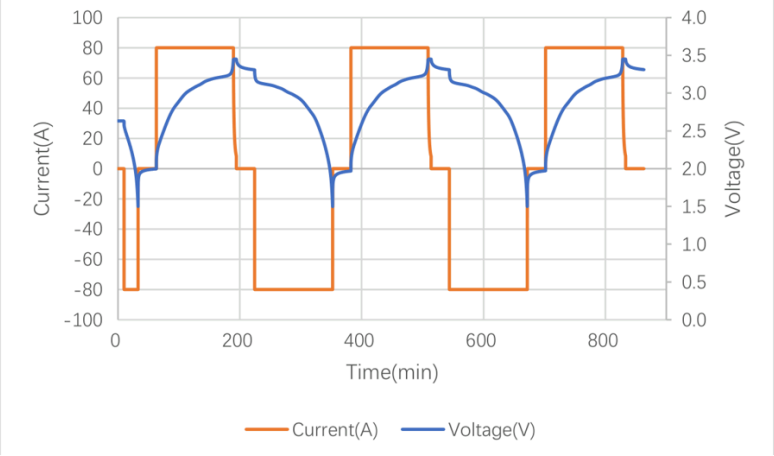
Attachment 2 - Cell charge/discharge conditioning graphs

Sample Number: CWN260910-01#



Sample Number: CWN260910-02#



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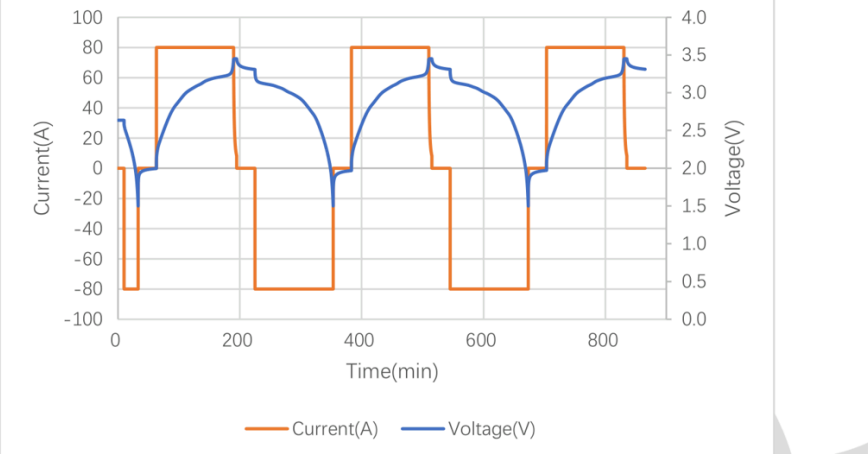
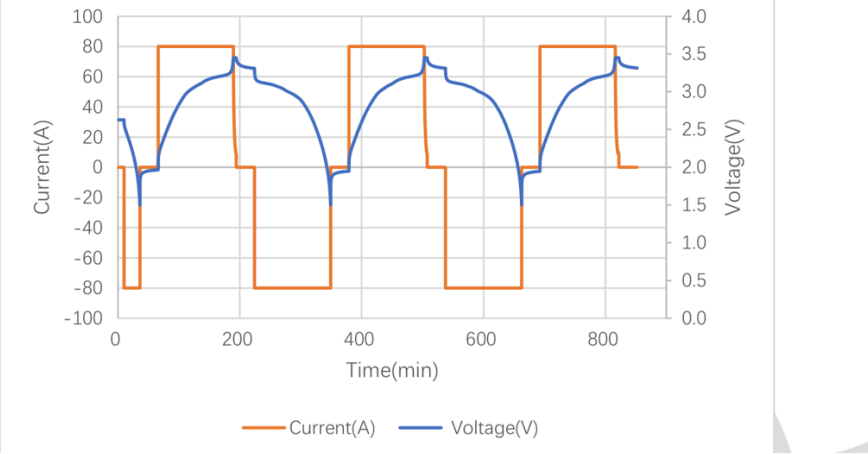
Attachment 2 - Cell charge/discharge conditioning graphs

Sample Number: CWN260910-03#



Sample Number: CWN260910-05#



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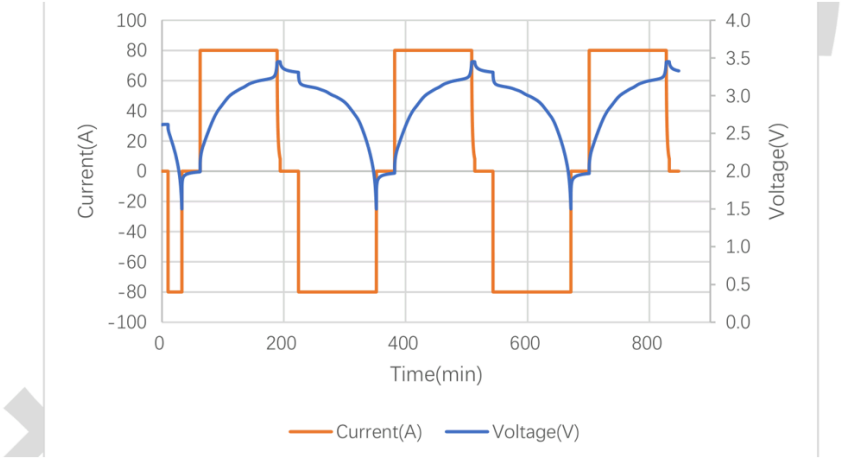
Attachment 2 - Cell charge/discharge conditioning graphs

Sample Number: CWN260910-04#



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Attachment 3 – Photos

General sample photos

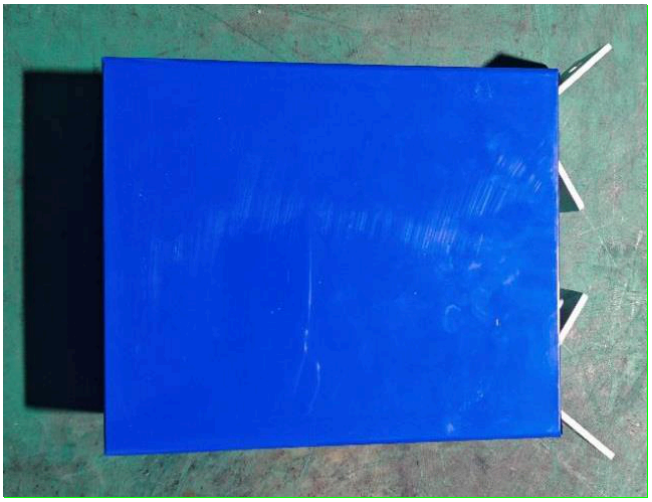

Figure 1: Large surface view



Figure 2: Side surface view

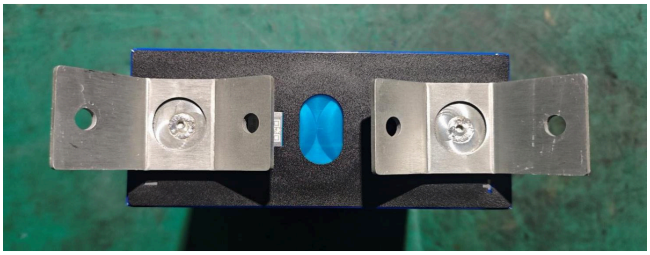

Figure 3: Terminal and vent view

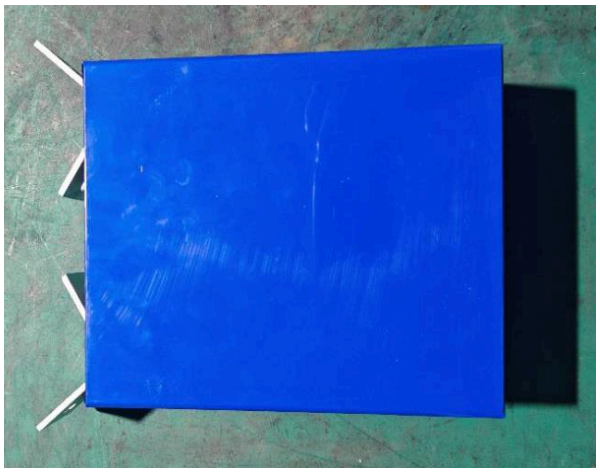

Figure 4: Bottom surface view

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Attachment 3 – Photos

Photos with heater and thermocouple installation

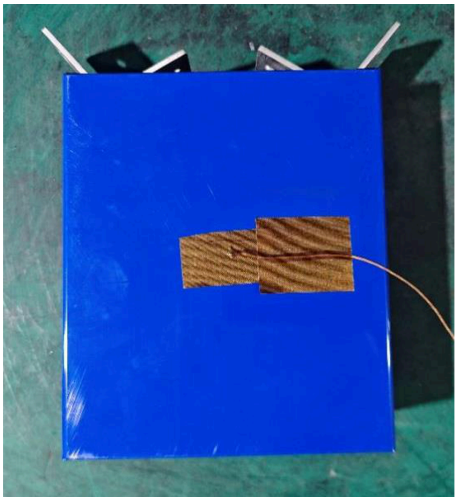

Figure 5: TC location on cell large surface

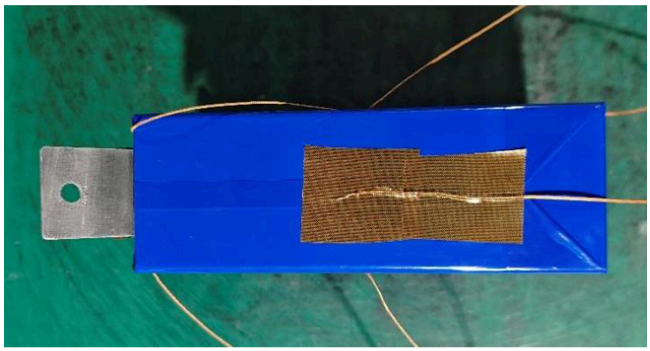

Figure 6: TC location on cell side surface

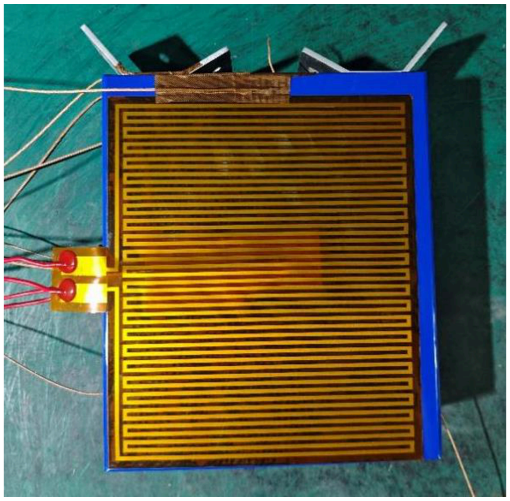

Figure 7: TC location on cell wide surface not covered by heater

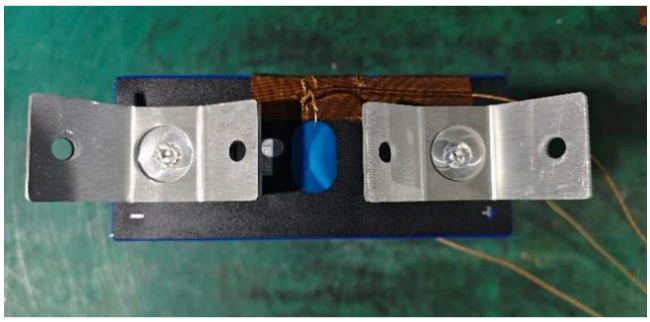

Figure 8: TC location near cell vent

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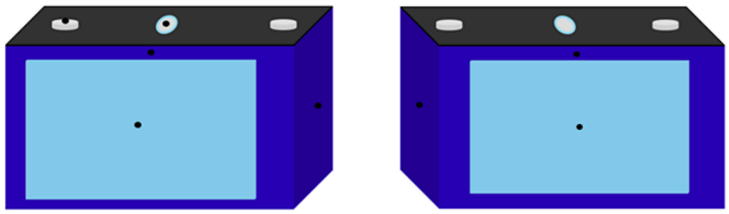
Attachment 3 – Photos

i. 电压监控
ii. 温度监控：
热电偶位置如下：
-电芯大面中心与加热片贴合的一侧（2 个大面）
T1(Front),T2(Back)
-电芯大面未被加热片覆盖部分 T3(Front), T4(Back)
-电芯泄气阀 T5
-正极端子 T6
-电芯侧面 T7(Upside), T8(Downside)
-夹具与加热片之间 T9(Front), T10(Back)
-环温 T11



Front View　　Back View

● Thermocouple

Figure 9: TC location map

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Attachment 3 – Photos

Sample Number: CWN260910-01#

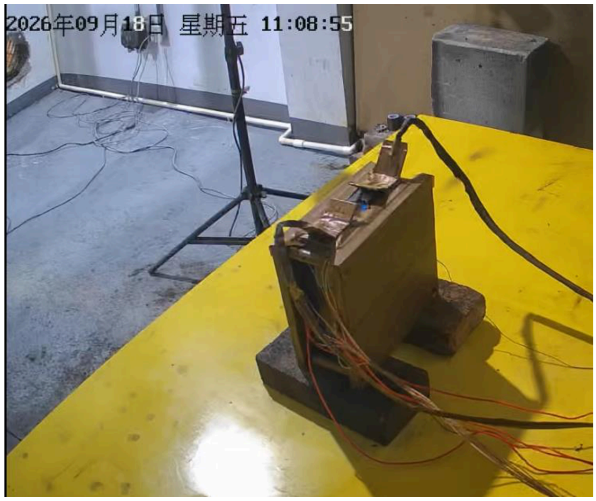

Figure 10: At test start (Local time 11:08)



Figure 11: During cell venting (Local time 11:47)



Figure 12: During thermal runaway (Local time 11:47)



Figure 13: Test over (Local time 14:11)

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Attachment 3 – Photos



Figure 14: After thermal runaway-1

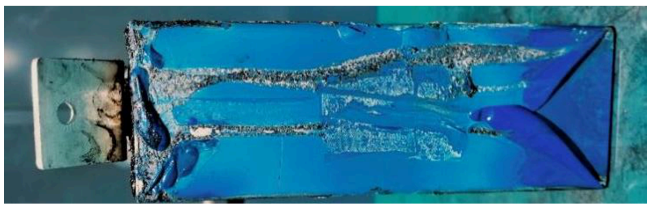

Figure 15: After thermal runaway-2



Figure 16: After thermal runaway-3



Figure 17: After thermal runaway-4

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Attachment 3 – Photos

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Figure 18: At test start (Local time 10:40)



Figure 19: During cell venting (Local time 11:18)



Figure 20: During thermal runaway (Local time 11:18)



Figure 21: Test over (Local time 13:37)

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Attachment 3 – Photos



Figure 22: After thermal runaway-1

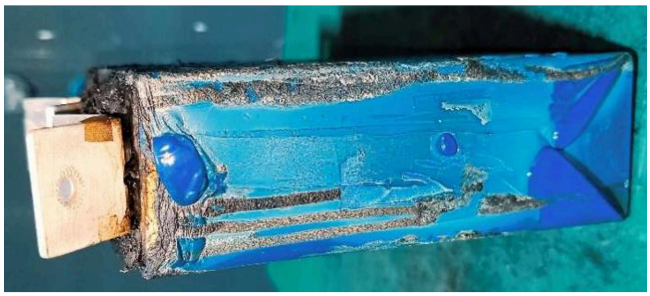

Figure 23: After thermal runaway-2

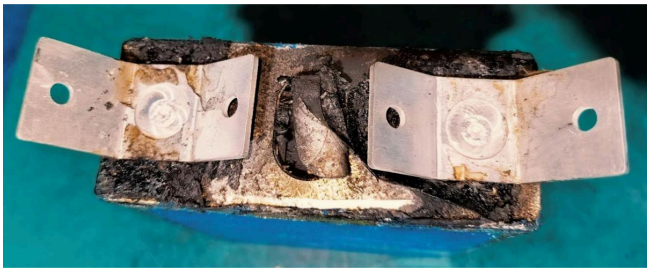

Figure 24: After thermal runaway-3



Figure 25: After thermal runaway-4

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Attachment 3 – Photos

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Figure 26: At test start (Local time 13:26)



Figure 27: During cell venting (Local time 14:01)



Figure 28: During thermal runaway (Local time 14:01)



Figure 29: Test over (Local time 16:34)

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Attachment 3 – Photos



Figure 30: After thermal runaway-1

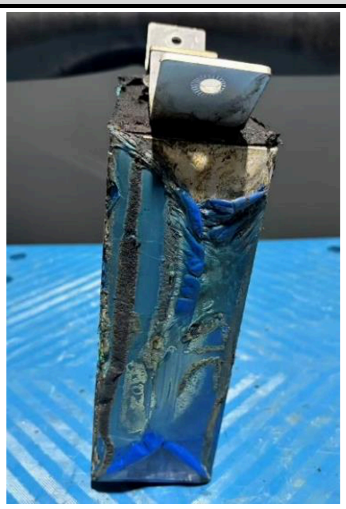

Figure 31: After thermal runaway-2



Figure 32: After thermal runaway-3



Figure 33: After thermal runaway-4

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Figure 34: At test start (Local time 13:45)

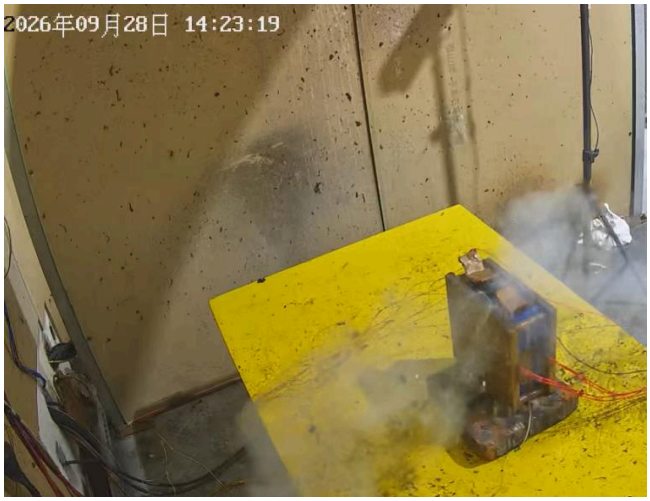

Figure 35: During cell venting (Local time 14:23)



Figure 36: During thermal runaway (Local time 14:23)



Figure 37: Test over (Local time 16:49)

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Attachment 3 – Photos



Figure 38: After thermal runaway-1

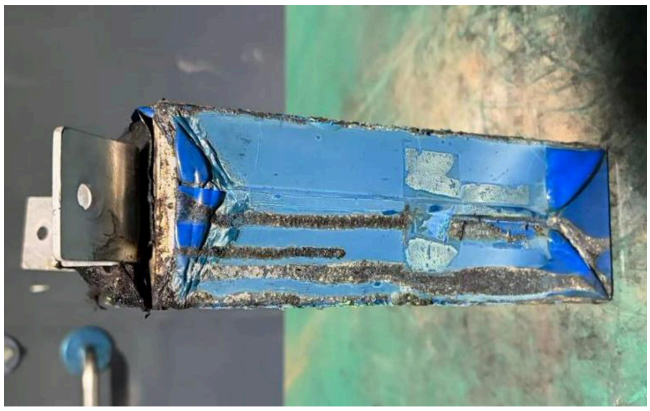

Figure 39: After thermal runaway-2

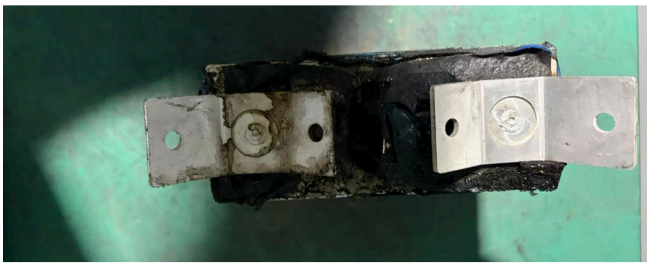

Figure 40: After thermal runaway-3

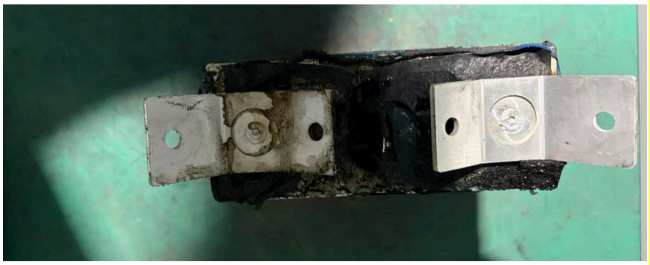

Figure 41: After thermal runaway-4

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Attachment 3 – Photos

Sample Number: CWN260910-04#

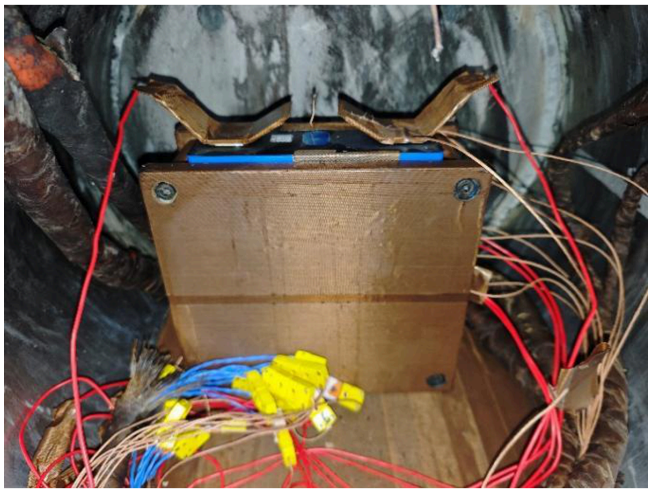

Figure 42: Cell in vessel before test

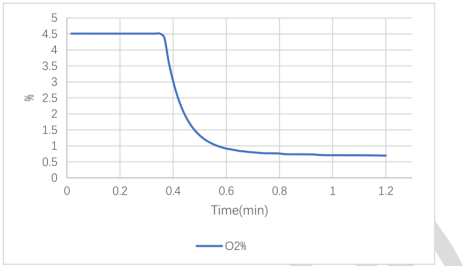

Figure 43: Oxygen concentration before test

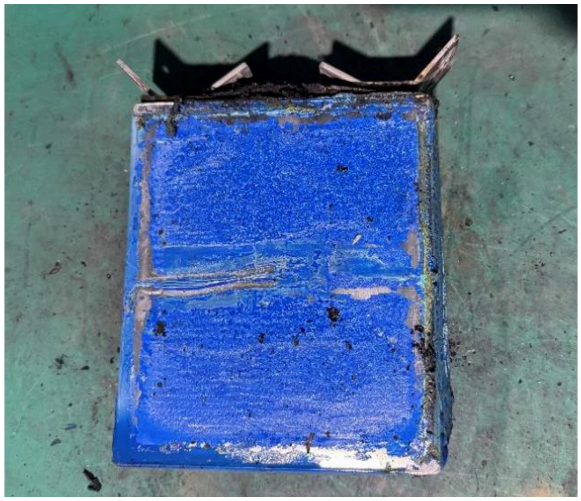

Figure 44: After thermal runaway-1

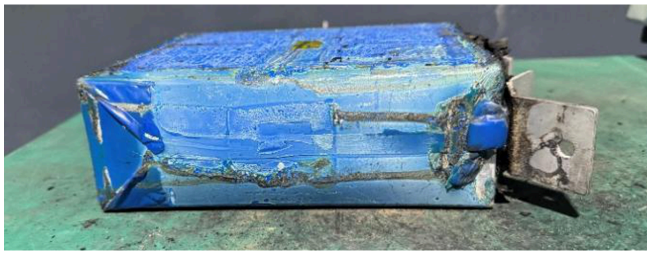

Figure 45: After thermal runaway-2

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Attachment 3 – Photos



Figure 46: After thermal runaway-3



Figure 47: After thermal runaway-4



Figure 48: After thermal runaway-5

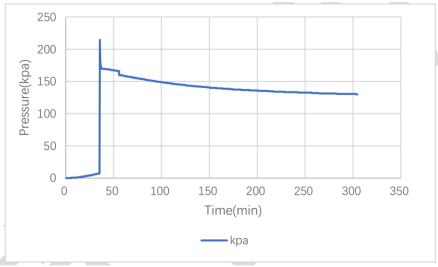

Figure 49: Pressure curve in the vessel

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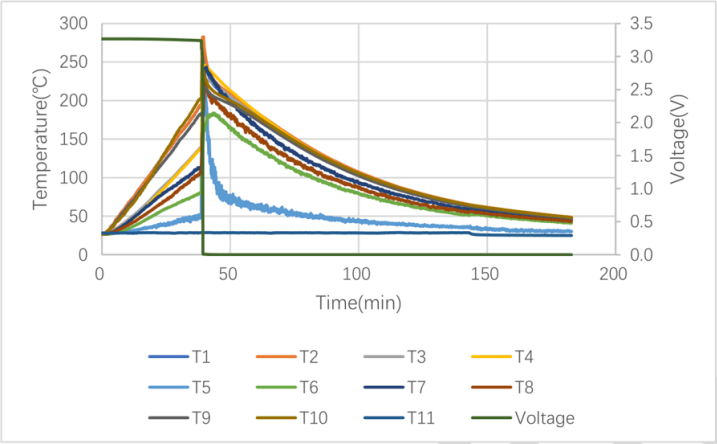
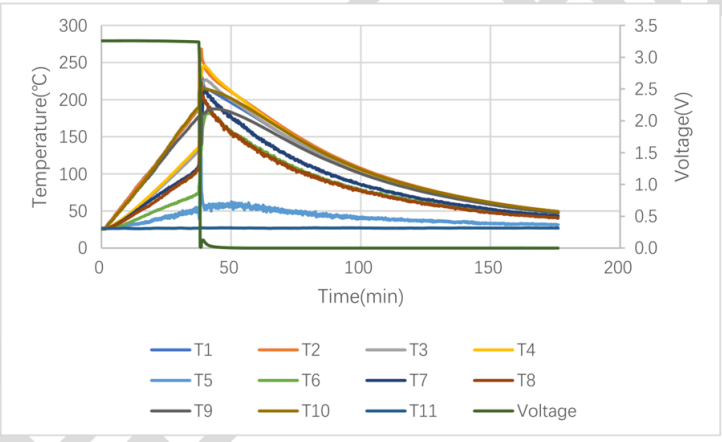
Attachment 4 - Cell temperature/voltage graph during testing

Sample Number: CWN260910-01#



Sample Number: CWN260910-02#



The results relate only to the items tested.
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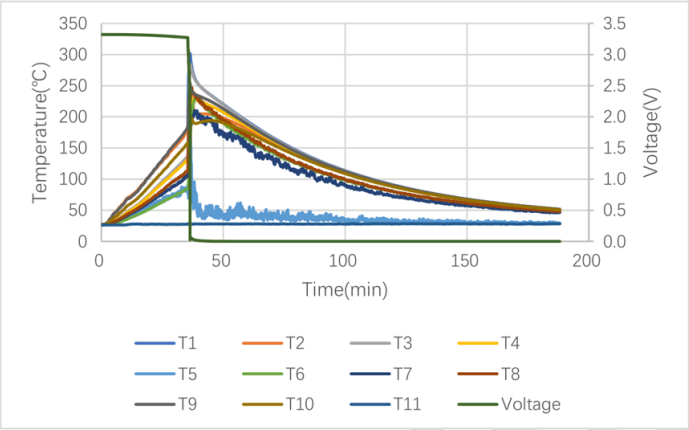
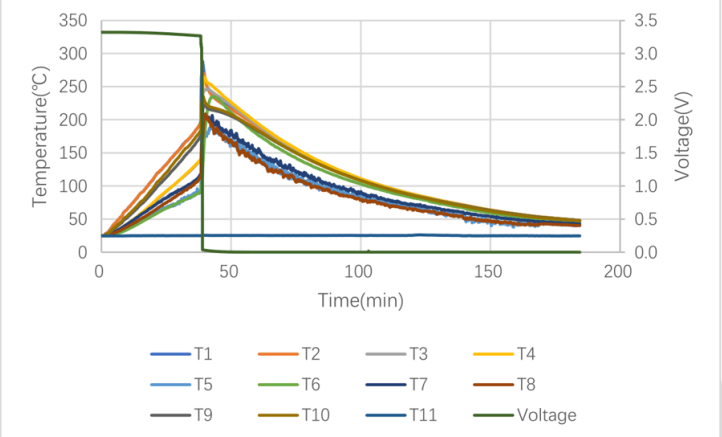
Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Attachment 4 - Cell temperature/voltage graph during testing

Sample Number: CWN260910-03#



Sample Number: CWN260910-05#



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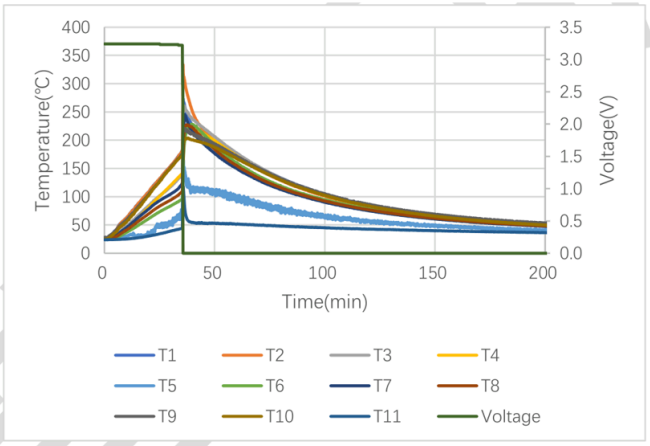
Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Attachment 4 - Cell temperature/voltage graph during testing

Sample Number: CWN260910-04#



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Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Attachment 5 – Cell gas analysis report

Test Items	Flammable (explosion) limits of gas and vapours - LFL
Test Method	ASTM E918-19 Standard Practice for Determining Limits of Flammability of Chemicals at Elevated Temperature and Pressure
Remarks	c_s= Concentration of sample; T_i= Initial temperature in each trial; p_i= Initial pressure in each trial; p_{ex}= Overpressure in each trial; L_1= The minimum sample concentration that gives flame propagation; L_2=The maximum sample concentration that does not give flame propagation; LFL= Lower flammable limit; LFL =$(L_1 + L_2)/2$ It is considered explosion occurred, if $p_{ex}/p\,i$≥ 1.07. Concentration defined in this report means volume percentage.
Test Conditions	Initial Temperature: (24±2)°C; Initial Pressure: (101±3)kPa
Environmental Conditions	Ambient Temperature: (22.6~23.6)°C; Relative Humidity: (32.0~69.0)%

Part of Test Data

No.	c_s [%]	T_i [°C]	p_i [kPa]	p_{ex} [kPa]	$p_{ex}/p\,i$	Ignition?
1	6.0	23	100.46	113.85	1.13	Yes
2	6.0	23	100.79	111.27	1.10	Yes
3	6.0	23	100.60	112.29	1.12	Yes
4	5.8	22	100.67	100.83	1.00	No
5	5.8	23	100.71	101.25	1.01	No
6	5.8	24	100.58	100.81	1.00	No
Result:	L1=6.0%, L2=5.8%,LFL=5.9% at (24±2)°C and (101±3) kPa.					

ORIGINAL TEST DATA

The results relate only to the items tested.
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Master Contract:	/	Model:	NaCP71173208-160E3	Page number 32 of 35
Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Test Items	Flammable (explosion) limits of gas and vapours - LFL
Test Method	ASTM E918-19 Standard Practice for Determining Limits of Flammability of Chemicals at Elevated Temperature and Pressure
Remarks	c_s= Concentration of sample; T_i= Initial temperature in each trial; p_i= Initial pressure in each trial; p_{ex}= Overpressure in each trial; L_1= The minimum sample concentration that gives flame propagation; L_2=The maximum sample concentration that does not give flame propagation; LFL= Lower flammable limit; LFL =$(L_1 + L_2)/2$ It is considered explosion occurred, if $p_{ex}/p\,i$≥ 1.07. Concentration defined in this report means volume percentage.
Test Conditions	Initial Temperature: (158±2)°C; Initial Pressure: (101±3)kPa
Environmental Conditions	Ambient Temperature: (22.6~23.6)°C; Relative Humidity: (32.0~69.0)%

Part of Test Data

No.	c_s [%]	T_i [°C]	p_i [kPa]	p_{ex} [kPa]	$p_{ex}/p\,i$	Ignition?
1	5.6	159	100.25	108.83	1.09	Yes
2	5.6	158	100.21	107.17	1.07	Yes
3	5.6	159	99.98	107.60	1.08	Yes
4	5.4	159	100.15	105.10	1.05	No
5	5.4	158	100.21	105.21	1.05	No
6	5.4	159	100.31	106.31	1.06	No
Result:	L1=5.6%, L2=5.4%, LFL=5.5% at (157.8±2)°C and (101±3)kPa.					

The results relate only to the items tested.
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Test Items	Maximum explosion pressure of gases and vapours
Test Method	EN 15967:2022 Determination of maximum explosion pressure and the maximum rate of pressure rise of gases and vapours
Test Apparatus	Test Vessel: 9.21L closed sphere; Ignition System: Spark
Preparation of test mixtures	Partial pressure method used inside the vessel
Test Conditions	Initial Temperature: (22±2)°C; Initial Pressure: (101±3)kPa
Environmental Conditions	Ambient Temperature: (22.3~23.7)°C; Relative Humidity: (32.0~59.0)%
Remarks	c_s= Concentration of sample; p_{max}= Maximum explosion pressure; $p_{ex,n}$=p_{ex} in different trials at a certain concentration; $p_{ex,max}$= The maximum value of all the $p_{ex,n}$ at a certain concentration; p_{mean}= The average value of all the $p_{ex,n}$ at a certain concentration; p_{lowest}= Lowest explosion pressure in 5 (resp. 3) tests; $p_{highest}$= Highest explosion pressure in 5 (resp. 3) tests. p_{max} is expressed as the maximum value of $p_{ex,max}$ Concentration defined in this report means volume percentage.

Part of Test Data

No.	c_s [%]	$p_{ex,1}$ [bar]	$p_{ex,2}$ [bar]	$p_{ex,3}$ [bar]	$p_{ex,4}$ [bar]	$p_{ex,5}$ [bar]	p_{mean} [bar]
1	24.0	0.5258	0.5187	0.5184	--	--	0.5209
2	25.0	0.5595	0.5326	0.5533	--	--	0.5484
3	25.8	0.5480	0.5324	0.5344	--	--	0.5382
4	26.0	0.5842	0.5893	0.5924	--	--	0.5886
5	26.2	0.5978	0.5976	0.6071	--	--	0.6008
6	26.4	0.5748	0.5851	0.5838	--	--	0.5812
7	27.0	0.5405	0.5499	0.5435	--	--	0.5446
8	28.0	0.5390	0.5485	0.5329	--	--	0.5401

The results relate only to the items tested.
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Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Determination of the explosion pressure

No.	c_s [%]	p_{lwoest} [bar]	$p_{highest}$ [bar]	p_{mean} [bar]	$p_{ex,max}$ [bar]
1	24.0	0.5258	0.5187	0.5184	0.5209
2	25.0	0.5595	0.5326	0.5533	0.5484
3	25.8	0.5480	0.5324	0.5344	0.5382
4	26.0	0.5842	0.5893	0.5924	0.5886
5	26.2	0.5978	0.5976	0.6071	0.6008
6	26.4	0.5748	0.5851	0.5838	0.5812
7	27.0	0.5405	0.5499	0.5435	0.5446
8	28.0	0.5390	0.5485	0.5329	0.5401

Determination of the maximum explosion pressure	
Content of flammable substance	26.2%
Smallest flammable substance content increment	0.2%
Maximum explosion pressure	6.071bar

Result:

ORIGINAL TEST DATA

The results relate only to the items tested.
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Master Contract:	/	Model:	NaCP71173208-160E3	Page number 35 of 35
Project / Network:	80322411	Description:	Rechargeable Sodium-ion Cell	

Test Items	Burning velocity of flammable gases
Test Method	ISO 817:2014 Refrigerants—Designation and safety classification
Test Conditions	Initial Temperature: (22±2)°C; Initial Pressure: (101±3)kPa
Environmental conditions	Ambient Temperature: (21.9~23.4)°C; Relative Humidity: (32~69)%
Remarks	c_s= Concentration of sample; S_s= Flame propagation speed; a_f = Cross-sectional area of flame bottom; A_f = Flame surface area; S_u= Burning velocity. $S_u = S_S \times \frac{a_f}{A_f}$ Concentration defined in this report means volume percentage.

Part of Test Data

No.	c_s [%]	S_S [cm/s]	a_f/A_f /	S_u [cm/s]
1	22.0	152.816	0.33	50.429
2	23.0	164.393	0.34	55.893
3	23.8	166.923	0.34	56.753
4	24.0	193.750	0.30	58.125
5	24.2	169.531	0.33	55.945
6	24.4	159.558	0.34	54.249
7	26.0	166.923	0.32	53.415
Result:	Su=58.125cm/s at room temperature and atmospheric pressure.			

End of Report….