检　验　报　告

产品名称：SW18650-25SP

检验类型：周期检验

东莞市振华新能源科技有限公司

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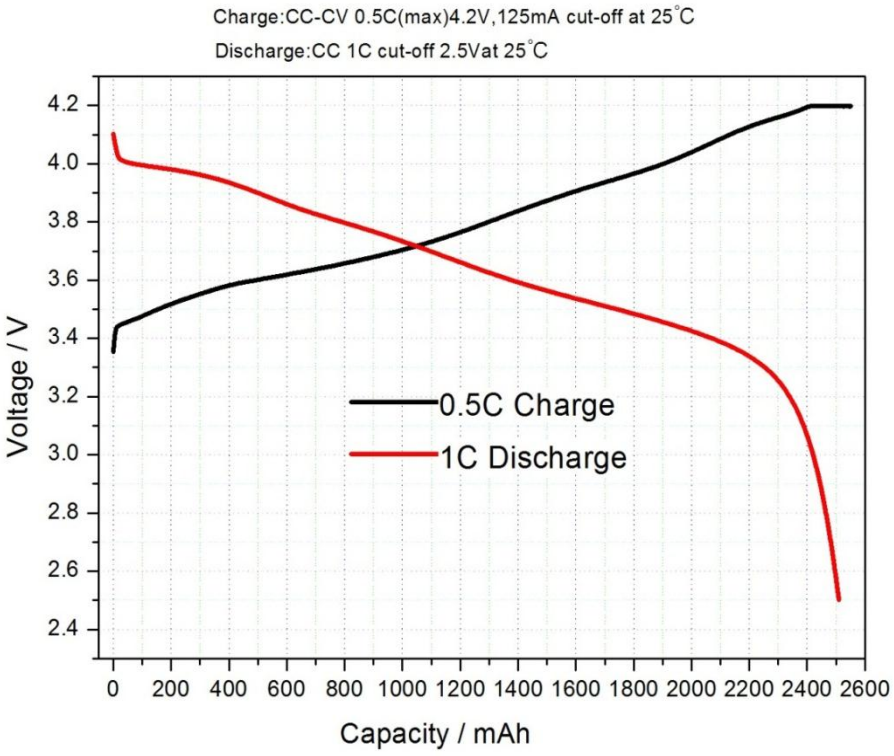
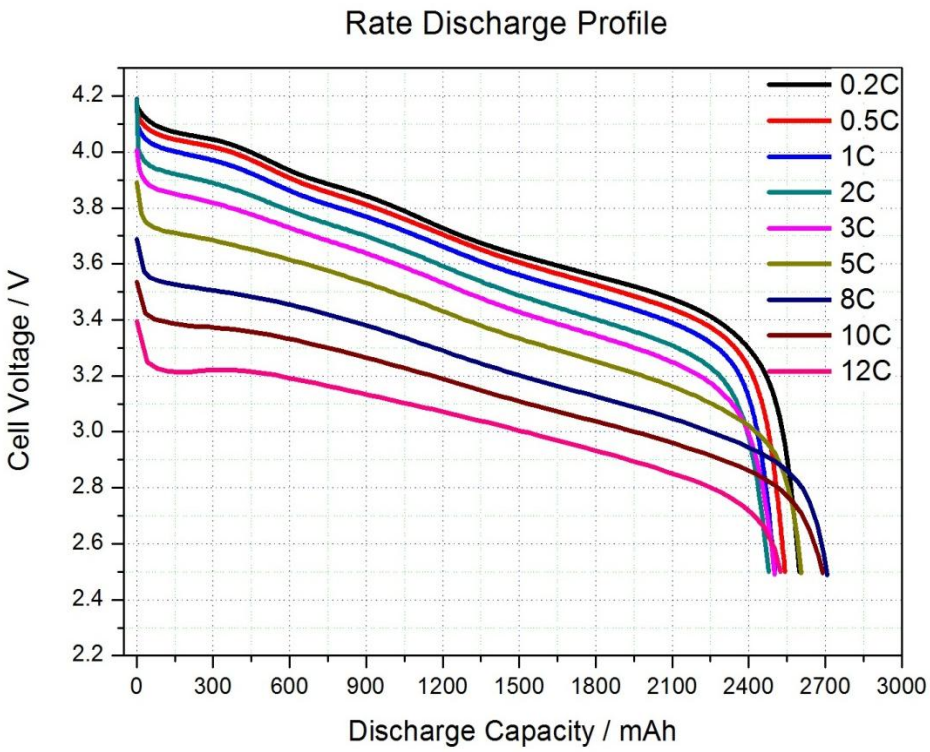
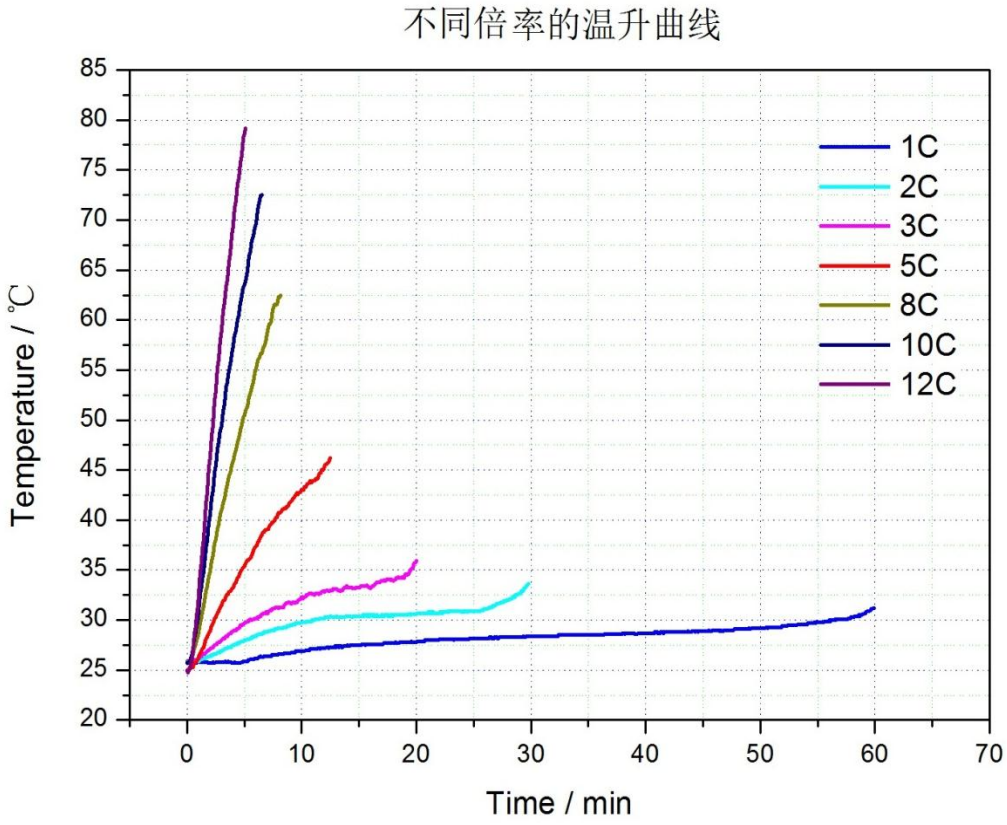
1、电性能 Electrical Characteristics

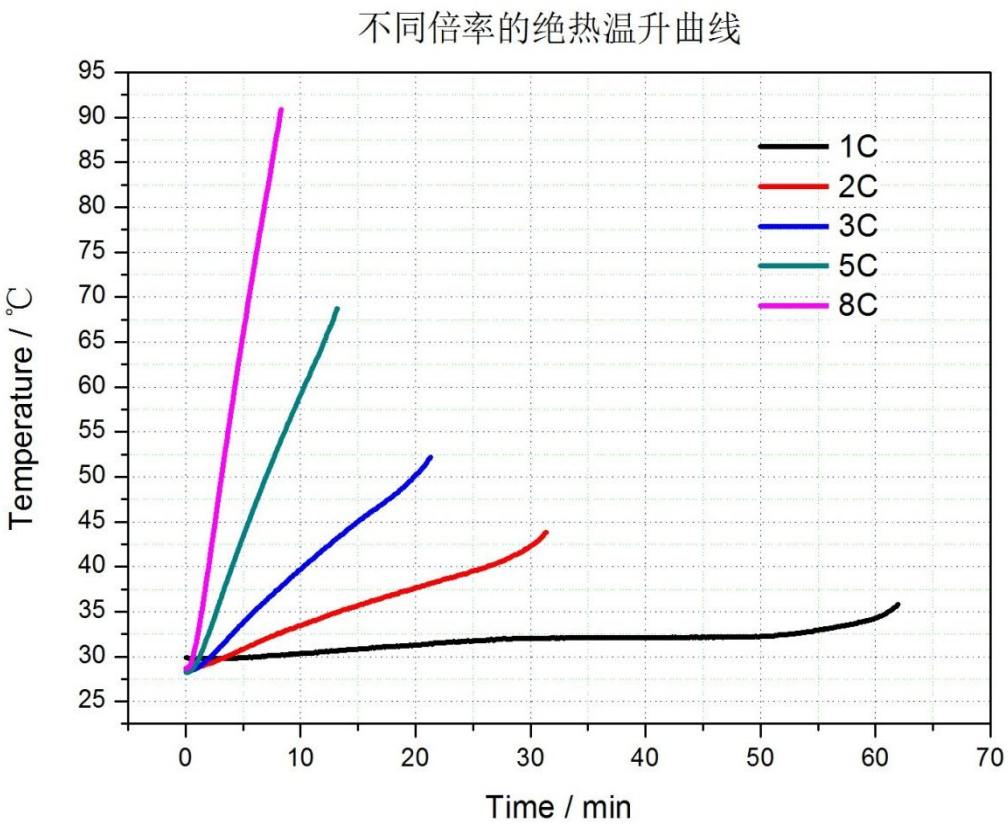
1.1 充放电性能





1.2 不同倍率的温升曲线 **Different rate for temperature**





1.3 倍率放电 Discharge at different Rate

测试方法 Test Method	标准充电后按不同倍率放电容量同$0.2C_1$放电容量的百分比 Cells shall be charged per standard charge profile. The discharge capacity of each cell at respective discharge rate shall be compared with the discharge capacity at $0.2C_1$
测试标准 Criterion	0.2C =100%， 0.5C ≥96% ，1.0C ≥95% ， 2.0C ≥95% ，3.0C ≥95% ， 5.0C ≥95% ,8.0C ≥95%

样品编号 Sample No.	初始性能 Before		0.2C		0.5C			1C			2C			3C			5C			8C			10C			12C			备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	容量 Capacity (mAh)	保持率 Capacity Retention	温度 Temperature(℃)	
1	4.130	13.7	2600	28.1	2544	97.82%	29.2	2507	96.40%	30.6	2483	95.49%	31.9	2504	96.30%	35.3	2595	99.78%	43.9	2699	103.80%	57.5	2696	103.68%	66.8	2617	100.65%	76.1	
2	4.129	13.6	2595	28.1	2537	97.75%	29.9	2494	96.12%	31.8	2484	95.75%	33.0	2476	95.40%	35.8	2581	99.47%	47.3	2697	103.94%	63.9	2692	103.75%	75.7	2626	101.18%	89.0	
3	4.128	14.1	2598	28.1	2541	97.81%	29.6	2502	96.29%	31.2	2478	95.36%	33.6	2502	96.29%	35.9	2606	100.30%	46.2	2707	104.17%	62.5	2689	103.48%	72.5	2525	97.18%	79.2	

参考文件Reference： 《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

1.4 高温性能 High discharge of Temperature Characteristics

测试方法 Test Method	将电池按标准充电制式充满电后放置于55℃±2℃下5h，再以1C_1恒流放电至2.5V，记录其相应的放电容量。 The cell are conditioned at 55±2 ℃ for 5h and following the standard charge method，And discharge under constant current 1C_1,cut-off voltage 2.5V，Record for discharge Capacity.
判定标准 Criterion	其容量应不低于初始容量的100%。 The test capacity should be not less than 100% of rated capacity.

测试记录Test Record

测试项目 Test Item	样品编号 Sample No.	初始性能 Before			测试结果 Result		判定标准 Criterion	判定结果 Judgement Result
		电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	放电容量 Capacity at the Temp(mAh)	容量保持率 Capacity Retention		
55 ±2 ℃ 1 C_1	4	4.153	13.5	2475.1	2643.4	106.80%	⩾100%	OK
	5	4.155	13.6	2464.8	2635.7	106.93%		
	6	4.156	13.6	2489.6	2651.6	106.51%		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

1.5 低温性能 Low discharge of Temperature Characteristics

测试方法 Test Method	将电池按标准充电制式充满电后放置于－20℃±2℃下24h，再以1C_1恒流放电至2.5V，记录其相应的放电容量。 The cell are conditioned at -20±2 ℃ for 24h and following the standard charge method，And discharge under constant current 1C_1,cut-off voltage 2.5V，Record for discharge Capacity.
判定标准 Criterion	其容量应不低于初始容量的70%。 The test capacity should be not less than 70% of rated capacity.

测试记录Test Record

测试项目 Test Item	样品编号 Sample No.	初始性能 Before			测试结果 Result		判定标准 Criterion	判定结果 Judgement Result
		电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	放电容量 Capacity at the Temp(mAh)	容量保持率 Capacity Retention		
－20 ±2 ℃ 1 C_1	7	4.155	13.5	2460.3	2141.0	87.02%	⩾70%	OK
	8	4.160	13.4	2466.3	2181.7	88.46%		
	9	4.159	13.7	2494.6	2183.7	87.54%		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

1.6 荷电保持力 Storage Characteristics

测试方法 Test Method	电池按标准充电制式充电结束后，25±2℃放置28天；然后将电池1C_1 恒流放电至终止电压2.5V，最后按标准充放电制式做1次充放电循环，测试其恢复容量。 The cells are standard fully charge to be conditioned at 25±2 ℃ for 28d and discharged at the rate of 1C_1 with its cut-off voltage 2.5V . After the standard charged and discharged method for one cycle,Capacity retension for test.
判定标准 Criterion	容量保持率≥92%，容量恢复率≥96%。 capacity retention≥92%, Capacity Recovery≥96%

测试记录Test Record

测试项目 Test Item	样品编号 Sample No.	初始性能 Before			测试结果 Result				判定标准 Criterion	判定结果 Judgement Result
		电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	保持容量 Capacity for the fist time (mAh)	容量保持率 Capacity Retention	恢复容量 Capacity for the second time (mAh)	容量恢复率 Capacity Recovery		
25 ℃±2 ℃ 28 d	10	4.146	13.5	2546.9	2469.1	96.95%	2526.8	99.21%	保持率≥92% 恢复率≥96%	OK
	11	4.142	13.6	2465.1	2400.1	97.36%	2441.3	99.03%		
	12	4.141	13.5	2462.7	2393.3	97.18%	2443.5	99.22%		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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1.7 高温荷电保持力 High temperature Storage Characteristics

测试方法 Test Method	电池按标准充电制式充电结束后，将电芯放入55±2℃的高温箱中储存7d，然后将电池放置在25±2℃下静置5h再以$1C_1$标准放电至终止电压2.5V，最后按标准充放电制式做1次充放电循环，测试其恢复容量。 The cells are standard fully charge to be conditioned at 55±2 ℃ for 7d，After storing for 5h at 25±2℃，Then cells are discharged at the rate of $1C_1$ with its cut-off voltage 2.5V . After the standard charged and discharged method for one cycle,Capacity retension for test.
判定标准 Criterion	容量保持率≥88%，容量恢复率≥92%。 capacity retention≥88%, Capacity Recovery≥92%

测试记录Test Record

测试项目 Test Item	样品编号 Sample No.	初始性能 Before			测试结果 Result						判定标准 Criterion	判定结果 Judgement Result
		电压 OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	电压 OCV (V)	内阻 AC IR (mΩ)	保持容量 Capacity for the fist time (mAh)	容量保持率 Capacity Retention	恢复容量 Capacity for the second time (mAh)	容量恢复率 Capacity Recovery		
55±2℃ 7d	13	4.152	13.6	2488.8	4.110	14.1	2344.8	94.21%	2455.8	98.67%	保持率≥88% 恢复率≥92%	OK
	14	4.143	13.6	2513.9	4.109	14.4	2347.0	93.36%	2462.1	97.94%		
	15	4.148	13.7	2494.5	4.111	14.3	2355.0	94.41%	2462.4	98.71%		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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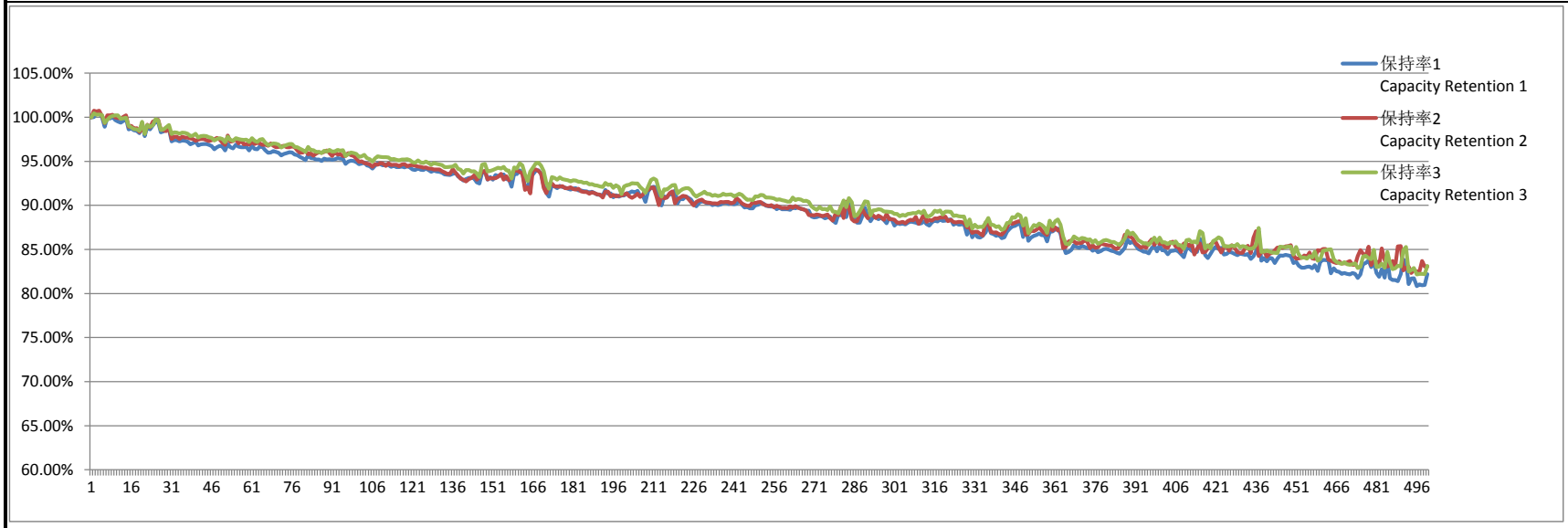
1.8.1 循环寿命 0.5C charge and 1C discharge Cycle Life

测试方法 Test Method	电池循环寿命试验应在环境温度25±2 ℃的条件下进行，以0.5 C充电，截止电流为0.02 C，搁置30-60 min后以1C放电，截止电压为2.5 V；放电结束后，搁置30-60 min，再进行下一个充放电循环。 The room temperature is 25 ±2℃. Cells are full charged at the rate of 0.5 C in CC-CV with its top-off charge current 0.02 C. After storing for 30-60 min , they are discharged at the rate of 1C with its cut-off voltage 2.5V. Then repeating two steps for more cycles.
测试标准 Criterion	500次循环后放电容量>80%首次容量 500th cycle>80% of 1st Cycle Capacity

测试记录Test Record

编号 No.	初始性能 Before Cycle				100次循环后 After 100 Cycles				200次循环后 After 200 Cycles				300次循环后 After 300 Cycles				500次循环后 After 500 Cycles				测试结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	重量 Weight (g)	容量 Capacity (mAh)	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention		
19	4.156	13.7	44.53	2498.8	4.134	13.7	2371.8	94.92%	4.128	13.9	2277.4	91.14%	4.107	14.0	2208.0	88.36%	4.092	14.2	2053.9	82.20%	OK	
20	4.160	14.6	44.56	2503.7	4.132	15.1	2386.4	95.31%	4.125	16.3	2283.7	91.21%	4.105	16.8	2214.3	88.44%	4.094	17.2	2079.7	83.07%		
21	4.156	14.1	44.45	2461.6	4.130	14.3	2359.0	95.83%	4.127	14.7	2268.7	92.16%	4.104	15.5	2196.5	89.23%	4.090	16.8	2046.5	83.14%		

循环曲线图The Curve of the Cycle Performace



参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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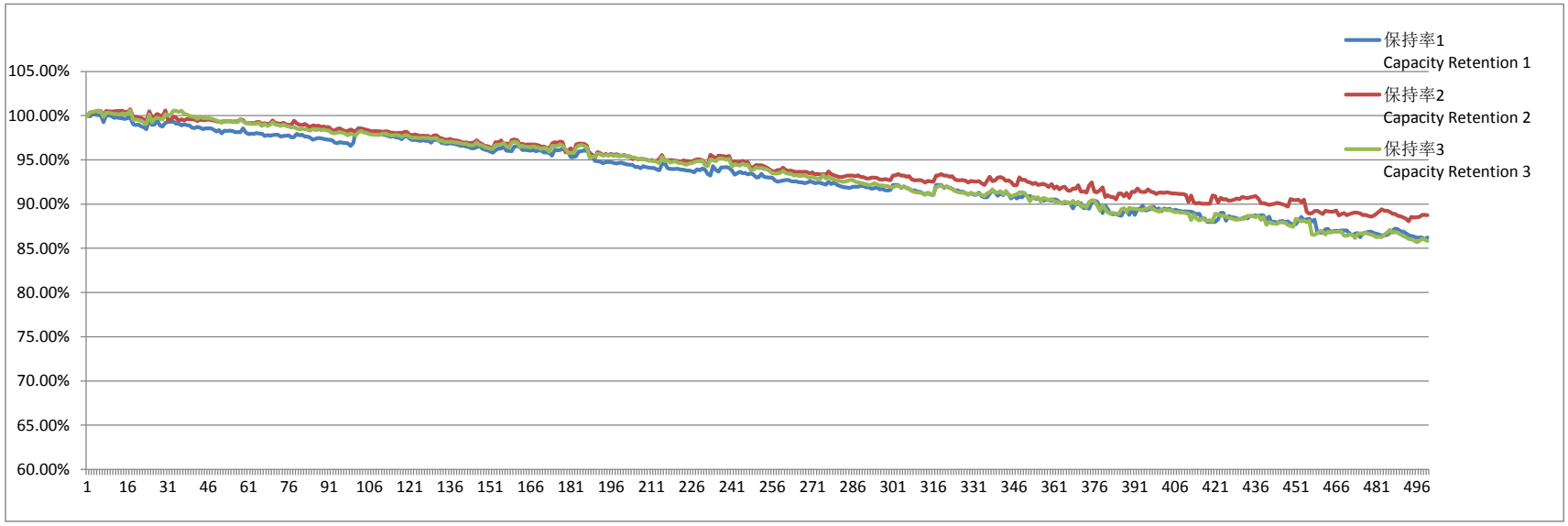
1.8.2 循环寿命 0.5C charge and 5C discharge Cycle Life

测试方法 Test Method	电池循环寿命试验应在环境温度25±2 ℃的条件下进行，以0.5 C充电，截止电流为0.02 C，搁置30-60 min后以5C放电，截止电压为2.5 V；放电结束后，搁置30-60 min，再进行下一个充放电循环。 The room temperature is 25 ±2℃. Cells are full charged at the rate of 0.5 C in CC-CV with its top-off charge current 0.02 C. After storing for 30-60 min , they are discharged at the rate of 5C with its cut-off voltage 2.5V. Then repeating two steps for more cycles.
测试标准 Criterion	500次循环后放电容量>80%首次容量 500th cycle>80% of 1st Cycle Capacity

测试记录Test Record

编号 No.	初始性能 Before Cycle				100次循环后 After 100 Cycles				200次循环后 After 200 Cycles				300次循环后 After 300 Cycles				500次循环后 After 500 Cycles				测试结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	重量 Weight (g)	容量 Capacity (mAh)	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention	电压OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	容量保持率 Capacity Retention		
19	4.158	13.5	44.48	2560.4	4.141	13.9	2481.1	96.90%	4.136	14.1	2424.2	94.68%	4.130	14.5	2345.3	91.60%	4.111	14.9	2207.5	86.22%	OK	
20	4.161	13.6	44.60	2583.5	4.145	13.7	2539.3	98.29%	4.140	13.7	2465.7	95.44%	4.144	13.8	2395.0	92.70%	4.111	14.2	2292.7	88.74%		
21	4.162	13.7	44.55	2569.6	4.144	13.7	2514.4	97.85%	4.141	13.8	2454.7	95.53%	4.151	14.0	2362.7	91.95%	4.111	14.5	2205.5	85.83%		

循环曲线图The Curve of the Cycle Performace



参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

2、环境适应性能 Environmental Characteristics

2.1 低气压 Low Pressure

测试方法 Test Method	充满电的电池将其搁置在真空箱中，真空箱密闭后，逐渐减少其内部压力至不高于11.6 KPa（模拟海拔15240 m）并保持6 h。 Fully charged cell is placed in vacuum chamber ≤11,6 kPa for 6h .
测试标准 Criterion	电池外观应无明显变形、锈蚀、冒烟或爆炸，电池开路电压应不低于90%的初始电压 No fire、No explosion、No leakage

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test			测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	电压 OCV (V)	电压变化率change (%)	电池外观 Appearance		
28	4.161	13.6	4.160	99.98%	无明显变形、锈蚀、冒烟或爆炸	OK	
29	4.163	13.8	4.161	99.95%	无明显变形、锈蚀、冒烟或爆炸		
30	4.162	13.2	4.161	99.98%	无明显变形、锈蚀、冒烟或爆炸		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

2.3 温度循环 Temperature Cycling

测试方法 Test Method	充满电的电芯在75±2℃中保持6h，温度降为-40±2℃保持6h做循环，每步的温度变化在30分钟内完成,做10个循环，然后至少放置24小时。 Fully charged cells are subjected to 75±2℃ keep 6h,and -40±2℃ keep 6h temperature cycling, change the temperature within 30 min for each step,10 cycles, then store at least 24h.
测试标准 Criterion	电池外观应无明显变形、锈蚀、冒烟或爆炸，电池开路电压应不低于90%的初始电压 No fire、No explosion、No leakage

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test			测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	电压 OCV (V)	电压变化率change (%)	电池外观 Appearance		
28	4.160	13.6	4.154	99.86%	无明显变形、锈蚀、冒烟或爆炸	OK	
29	4.161	13.8	4.158	99.93%	无明显变形、锈蚀、冒烟或爆炸		
30	4.161	13.2	4.158	99.93%	无明显变形、锈蚀、冒烟或爆炸		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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2.2 振动 Vibration

测试方法 Test Method	电池按标准充电结束后，将电池固定在振动台上，按下面的振动频率和对应的振幅调整好试验设备，电池在X、Y、Z三个方向每个方向上从10Hz～55Hz循环扫频振动30min，扫频速率为1oct/min。 振动频率：10Hz～30Hz 位移幅值(单振幅)：0.38mm 振动频率：30Hz～55Hz 位移幅值(单振幅)：0.19mm After standard fully charge, cell shall be attached to a vibration table directly and subjected to vibration that consists of 7 Hz to 200 Hz to 7 Hz in 15mins. In each of the three mutually perpendicular directions (X, Y, and Z axes) should be repeatedly vibrated 12 times for 3h.
测试标准 Criterion	电池外观应无明显变形、锈蚀、冒烟或爆炸，电池开路电压应不低于90%的初始电压 No fire、No explosion、No leakage

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test			测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	电压 OCV (V)	电压变化率change (%)	电池外观 Appearance		
28	4.154	13.6	4.149	99.88%	无明显变形、锈蚀、冒烟或爆炸	OK	
29	4.158	13.8	4.156	99.95%	无明显变形、锈蚀、冒烟或爆炸		
30	4.158	13.2	4.157	99.98%	无明显变形、锈蚀、冒烟或爆炸		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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2.4 自由跌落 Free Drop

测试方法 Test Method	电芯按标准充电制式充电结束后，将电芯样品由高度为1m的位置自由跌落到置于混凝土板（厚度18~20mm）上，从X、Y、Z正负方向(六个方向)每个方向自由跌落1次；然后按标准充放电进行不多于3次的循环。 After standard fully charge, a cell is dropped from a height of 1m to a wooden board (18-20mm thick) which is placed on the concrete ground. Cells shall be dropped in each of three mutually perpendicular directions(X, Y, and Z axes).
测试标准 Criterion	电池外观应无明显损伤、漏液、冒烟或爆炸，放电时间≥51min No fire、 No explosion、No leakage、Discharge Time ≥51min

测试记录Test Record

编号 No.	测试前 Before Test			测试后 After Test				测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	容量 Capacity (mAh)	放电容量 Recovery Capacity (mAh)	放电时间 Discharge Time (H:min)	容量恢复率 Capacity Retention	电池外观 Appearance		
28	4.149	13.6	2480.9	2475.3	0:59	99.77%	无明显变形、锈蚀、冒烟或爆炸	OK	
29	4.156	13.8	2470.9	2466.2	0:59	99.81%	无明显变形、锈蚀、冒烟或爆炸		
30	4.157	13.2	2461.7	2457.5	0:59	99.83%	无明显变形、锈蚀、冒烟或爆炸		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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3、安全性能测试 Safety Characteristics Test

3.1 热冲击 Thermal Abuse

测试方法 Test Method	电芯按标准充电制式充电结束后，将电芯用绝缘线悬挂在温度冲击箱（远红外鼓风烘箱或真空烤箱）中，冲击箱温度以5℃±2℃/min的速率上升到130℃±2℃，保持30min，观察电芯的状态。 The cell is charged following the standard charge method. After charging the cell is put in the oven. And then the oven temperature will be ramped at 5℃ per minute to 130℃ and held at 130℃. When the temperature of the cell reach 130℃, the cell is maintained in the 130℃ oven for a maximum of 30 minute or until a fire or explosion is obtained。
测试标准 Criterion	不起火、不爆炸 No fire、No explosion

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test	测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)			
31	4.157	13.4	不起火、不爆炸	OK	
32	4.159	13.3	不起火、不爆炸		
33	4.157	13.5	不起火、不爆炸		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

3.2 过充 Overcharge

测试方法 Test Method	将接有热电偶的电池放置于通风橱内。连接正负极于一恒流恒压电源，调节电流至3C、电压为10V，然后对电池进行充电，直至电池电压为10V，电流降到接近0。试验过程中监视电池温度变化，当电池温度下降到比峰值低约10℃。 The cell is discharged following the standard discharge method. The cell is to be subjected to CC/CV power by connecting its positive & negative terminal, then charge the cell up to 10V at CC of 3C until the test time is 7 hours or the cell case temperature has returned to be 10℃ less then peak temperature.
测试标准 Criterion	不起火、不爆炸，电池的外部温度不得高于150℃ No fire、No explosion

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test		测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	电池外观 Appearance	表面最高温度 Temperature (℃)		
34	4.160	13.4	不起火、不爆炸	58.9	OK	
35	4.157	13.6	不起火、不爆炸	56.7		
36	4.156	13.5	不起火、不爆炸	58.0		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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3.3 强制放电 Forced Discharge

测试方法 Test Method	25℃±5℃的环境温度下，电芯以 0.2C 进行放电至终止电压，然后以1C的电流对电芯进行反向充电90min，试验过程中监视电池温度变化。 In an ambient temperature of 20℃±5℃.A cell is to be force-discharged to cut-off voltage at a constant current of 0.2Cn,then reverse charge at a constant current of 1.0Cn , the discharging time is not less than 90 min.
测试标准 Criterion	不漏液、不起火、不爆炸，电池的外部温度不得高于150℃ No leakage、No fire、No explosion

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test		测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	电池外观 Appearance	表面最高温度 Temperature (℃)		
37	4.160	13.6	不漏液、不起火、不爆炸	33.6	OK	
38	4.157	14.7	不漏液、不起火、不爆炸	36.1		
39	4.161	13.4	不漏液、不起火、不爆炸	32.8		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

3.4 常温和高温短路 External Short-Circuit

测试方法 Test Method	电芯按标准充电制式充电结束后，在环境温度25℃±2℃或55℃±2℃的条件下，于通风橱内用80±20mΩ的电阻导线将电芯正负极短接，试验过程中关注温度变化，当电池温度下降到比峰值低约10℃。 Cell shall first be charged according to standard charge method, and then cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of 80±20mΩ. This test is done at room temperature(25℃±5℃) or at 55℃±5℃ (different cells). Monitor the cell temperature while testing. The cell is continuously discharged until the cell case temperature has returned to be 20% less then peak temperature or the test time is 24 hours.
测试标准 Criterion	不起火、不爆炸，电池的外部温度不得高于150℃ No fire、No explosion

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test		测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)	电池外观 Appearance	表面最高温度 Temperature (℃)		
40	4.159	13.6	不起火、不爆炸	113.5	OK	25℃
41	4.157	13.4	不起火、不爆炸	112.8		
42	4.155	14.1	不起火、不爆炸	111.9		
43	4.159	13.2	不起火、不爆炸	127.3	OK	55℃
44	4.160	13.5	不起火、不爆炸	130.6		
45	4.159	13.5	不起火、不爆炸	125.5		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

3.5 重物冲击 Impact

测试方法 Test Method	电芯按标准充电制式充电结束后，将9.1kg±0.1kg重物自610 mm±25mm高度自由落下，冲击已固定在夹具中的电池(电池面积最大的面应与台面垂直)，电池允许发生变形。 Cell shall first be charged according to standard charge method，then the battery cell was placed on a flat surface so that the longitudinal axis of the battery cell shall be parallel with it. A 15.8mm diameter bar is to be placed across the center of the sample. A 9.1kg weight is to be dropped from a height of 610mm on the sample.
测试标准 Criterion	不起火、不爆炸 No fire、No explosion

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test	测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)			
46	4.160	13.5	不起火、不爆炸	OK	
47	4.157	13.4	不起火、不爆炸		
48	4.157	13.6	不起火、不爆炸		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

3.6 挤压 Crush

测试方法 Test Method	电芯按标准充电制式充电结束后，电池置于两个平面内，垂直于极板方向进行挤压，两平板间施加13.0kN±0.78kN的挤压力,一旦压力达到最大值即可停止挤压试验，试验过程中电池不能发生外部短路，电池允许发生变形。 After charging a cell following the standard charge method, the cell shall be crushed between two flat surfaces. The direction of the crushing force shall be vertical to axis of the cylinder. The crushing force is approximately 13 KN. Once the maximum pressure has been obtained or until a fire or explosion is obtained it is to be released.
测试标准 Criterion	不起火、不爆炸 No fire、No explosion

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test	测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)			
49	4.158	13.6	不起火、不爆炸	OK	
50	4.157	13.5	不起火、不爆炸		
51	4.160	13.5	不起火、不爆炸		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018

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3.7 燃烧喷射 Projectile Test

测试方法 Test Method	电池放置在试验工装的钢丝网上。如果试验过程中会出现电池滑落的情况时，可用单根金属丝把电池样品固定在钢丝网上；如果无此类情况发生，则不可以捆绑电池。用火焰加热电池，当出现以下三种情况时停止加热： a）电池爆炸； b）电池完全燃烧； c）持续加热30min，但电池未起火、未爆炸。 Each test sample cell or battery is to be placed on a screen that covers a 102 mm (4 inch) diameter hole in the center of a platform table. The screen is to be constructed of steel wire mesh having 20 openings per inch (25.4 mm) and a wire diameter of 0.017 inch (0.43 mm); The screen is to be mounted 38 mm (1-1/2 inch) above a burner. The fuel and air flow rates are to be set to provide a bright blue flame that causes the supporting screen to glow a bright red; An eight-sided covered wire cage, 610 mm (2 feet) across and 305 mm (1 foot) high, made from metal screening is to be placed over the test sample. See Figure 20.1. The metal screening is to be constructed from 0.25 mm (0.010 inch) diameter aluminum wire with 16 – 18 wires per inch (25.4 mm) in each direction;The sample is to be heated and shall remain on the screen until it explodes or the cell or battery has ignited and burned out. It is not required to secure the sample in place unless it is at risk of falling off the screen before the test is completed. When required, the sample shall be secured to the screen with a single wire tied around the sample.
测试标准 Criterion	组成电池的部件（粉尘状产物除外）或电池整体不得穿透铝网 No part of an exploding cell or battery shall penetrate the wire screen such that some or all of the cell or battery protrudes through the screen。

测试记录Test Record

编号 No.	测试前 Before Test		测试后 After Test	测试 结果 Result	备注 Remark
	电压 OCV (V)	内阻 AC IR (mΩ)			
52	4.157	13.6	组成电池的部件（粉尘状产物除外）或电池整体不得穿透铝网	OK	
53	4.160	13.7	组成电池的部件（粉尘状产物除外）或电池整体不得穿透铝网		
54	4.160	13.9	组成电池的部件（粉尘状产物除外）或电池整体不得穿透铝网		

参考文件Reference：《圆柱形锂离子电池》企业标准 Q/ZHXNY 2-2018