锂离子电芯规格书

Specification
For
Lithium-ion Rechargeable Cell

电芯型号：26650-5000mAh

Cell Type: 26650-5000mAh

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1 Preface 前言

This specification describes the type and size, performance, technical characteristics, warning and caution of the lithium ion rechargeable cell. The specification only applies to 26650-5000mAh （without PTC） cell supplied by Jiangxi Hualiyuan Lithium Energy Co., Ltd.

本标准描述了圆柱型锂离子电芯的外型尺寸、特性、技术要求及注意事项。本标准适用于江西华立源锂能科技股份有限公司生产的圆柱型 26650-5000mAh（不带 PTC)锂离子电芯。

2 Definition 定义

2.1 Rated capacity:

标称容量:

Rated capacity: Cap=5000mAh.Under 25±2.5℃, It means the capacity value of being discharged by 2-hours rate to end voltage 2.75 V, which is signed Cap, the unit is mAh.

标称容量 Cap=5000mAh，指在 25±2.5℃环境下，以 2 小时率放电至终止电压 2.75 V 时的容量，以 Cap 表示，单位为毫安培时(mAh)。

2.2 Standard charge method:

标准充电方式:

Under 25±2.5℃, it can be charged to 4.2V with constant current of 0.5C, and then, charged continuously with constant voltage of 4.2V until the charged current is 0.01C.

指在 25±2.5℃环境下，以 0.5C 的电流恒流充电至单体电芯电压 4.2 V 后，转为恒压 4.2 V 充电，至充电电流小于 0.01C 时，停止充电。

2.3 Standard discharge method:

标准放电方式:

Under 25±2.5℃, it can be discharged to the voltage of 2.75V with constant current of 0.5C.

指在 25±2.5℃环境下，以 0.5C 的电流恒流放电至单体电芯电压 2.75 V。

3 Cell type and size 电芯型号及尺寸

3.1 Description and model 电芯说明及型号

Description: Cylindrical Li-ion rechargeable cell

类型：圆柱锂离子二次电芯

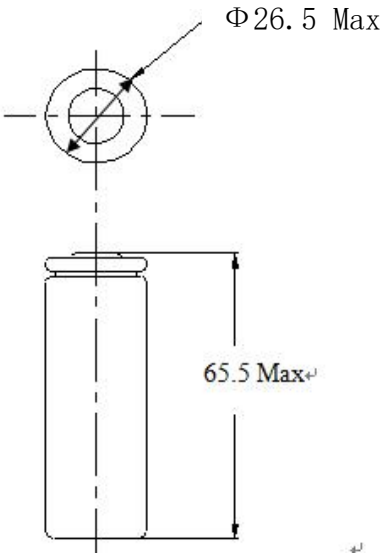
Model: 26650-5000mAh

型号：26650-5000mAh

3.2 Cell size 电芯尺寸

Cell physical dimension listed in next Figure (unit: mm).

电芯尺寸示意图如下图所示（单位：mm）。



4 Cell specification 电芯特性

ITEM 项目	SPECIFICATION 特性
Normal capacity 标称容量	5000 mAh@0.5C
Minimum capacity 最小容量	4950 mAh@0.5C (Discharge the cell from 4.2V to 2.75V by 0.5C current) (电芯以 0.5C 从 4.2V 放电至 2.75V)
Normal voltage 标称电压	3.6V
Charging voltage 充电电压	4.2 ±0.05 V
Discharge ending voltage 放电终止电压	2.75 ±0.05 V
Standard charging current 标准充电电流	0.5C(2500mA)
Standard discharge current 标准放电电流	1C(5000mA)
Max charge current 最大充电电流	1C(T≥10℃) 0.2C(10℃>T≥0℃)
Max continuous discharge current 最大持续放电电流	3C(27℃≥T≥23℃)
Max pulse discharge current 最大瞬时放电电流	5C(27℃≥T≥23℃)
Max recommended charge and discharge cell body temperature 充放电过程中电芯表面的最大推荐温度	Charge:0~ 60℃ Discharge:-20~ 60℃ 充电时：0~60℃ 放电时：-20~60℃
Maximum short term allowable charge and discharge cell body temperature. Charging and discharging at these conditions will shorten cell cycle life. 充放电过程中电芯表面的短时间最大温度（在	Charge: 60℃ Discharge: 75℃ 充电时：60℃ 放电时：75℃

这些情况下充放电将会导致电池循环寿命很快衰减）	
Internal resistance 内阻	≤20mΩ(AC Impedance, 1000 Hz)
Cell dimension 电芯尺寸	Height : 65.5 mm Max 最大高度：65.5 mm（含 PET 套管） Diameter : 26.5mm Max 最大直径：26.5 mm（含 PET 套管）
Weight 重量	96±2g

5 Technical characteristics 技术要求

5.1 Storage and Transportation Temperature & Relative humidity 存储和运输温度及湿度

Temperature 温度：1 个月 1 month -5～45℃ 3 个月 3month -5～35℃
1 年以上 1year -5～30℃ 建议存储温度 -5～35℃
Relative humidity 相对湿度： 0～45%RH

5.2 Cell testing conditions 电芯试验环境

Unless otherwise specified, all tests stated according to following:
除非有特殊说明，所有测试的环境条件要求如下：
Temperature 温度：25±2.5℃
Relative humidity 相对湿度： 0～75%RH

5.3 Requirement of the testing equipment 测量仪表要求

Voltage meter: The voltage tester internal resistance is ≥ 10 KΩ/V
电压仪表要求：测量电压的仪表内阻不小于 10KΩ/V
Temperature meter: The precision is ≤0.5℃
温度仪表要求：测量温度的仪表精度不低于 0.5℃

5.4 Electronic performance 电性能

NO. 序号	ITEM 测试项目	CRITERION 性能标准	TESTING METHOD 测试条件与方法
5.4.1	Discharge rate capability 倍率放电性能	$\frac{\text{discharge capacity at 0.5C}}{\text{discharge capacity at 0.2C}} \geq 96\%$ $\frac{\text{discharge capacity at 1.0C}}{\text{discharge capacity at 0.2C}} \geq 95\%$ $\frac{\text{discharge capacity at 2.0C}}{\text{discharge capacity at 0.2C}} \geq 94\%$ $\frac{\text{discharge capacity at 3.0C}}{\text{discharge capacity at 0.2C}} \geq 92\%$ $\frac{0.5C\text{放电容量}}{0.2C\text{放电容量}} \geq 96\%$ $\frac{1.0C\text{放电容量}}{0.2C\text{放电容量}} \geq 95\%$ $\frac{2.0C\text{放电容量}}{0.2C\text{放电容量}} \geq 94\%$ $\frac{3.0C\text{放电容量}}{0.2C\text{放电容量}} \geq 92\%$	The cell is charged according to standard charge method, hold for 45 minutes ,then it is discharged to 2.75V using 0.2C current; The cell is charged according to standard charge method, hold for 45 minutes ,then it is discharged to 2.75V using 0.5C current; The cell is charged according to standard charge method, hold for 45 minutes ,then it is discharged to 2.75V using 1.0C current; The cell is charged according to standard charge method, hold for 45 minutes ,then it is discharged to 2.75V using 2.0C current; The cell is charged according to standard charge method, hold for 45 minutes ,then it is discharged to 2.75V using 3.0C current; The discharge capacities of different current shall be recorded. 以标准充电方式进行充电，搁置 45 分钟，再以 0.2C 的电流放电至 2.75V； 接着以标准充电方式进行充电，搁置 45 分钟，再以 0.5C 的电流放电至 2.75V； 接着以标准充电方式进行充电，搁置 45 分钟，再以

			1C 的电流放电至 2.75V； 接着以标准充电方式进行充电，搁置 45 分钟，再以 2C 的电流放电至 2.75V； 最后以标准充电方式进行充电，搁置 45 分钟，再以 3C 的电流放电至 2.75V； 记录各个不同电流下的放电容量。
5.4.2	Cycle life 循环寿命 (0.5C/1C Cycle)	$\frac{\text{Discharge capacity of 1500th cycle}}{\text{Original discharge capacity}} \geqslant 80\%$ $\frac{\text{第 1500 次循环的放电容量}}{\text{初始放电容量}} \geqslant 80\%$	Ambient Temp: Room Temp&25 ℃ .Measured the initial capacity of battery. Then conduct $0.5I_1$(A)/$1I_1$(A) measured the final condition of battery. 在环境温度：室温或 25℃的条件下，测量电池的初始状态和初始容量，进行 0.5C/1C 循环，循环后测量电池的最终状态。
5.4.3	High-Low temperature discharge performance 高低温放电性能	$\frac{\text{discharge capacity at -10}^{O}\text{C}}{\text{discharge capacity at 25}^{O}\text{C}} \geq 60\%$ $\frac{\text{discharge capacity at 55}^{O}\text{C}}{\text{discharge capacity at 25}^{O}\text{C}} \geq 100\%$ $\frac{-10^{O}\text{C 放电容量}}{25^{O}\text{C放电容量}} \geq 60\%$ $\frac{55^{O}\text{C 放电容量}}{25^{O}\text{C放电容量}} \geq 100\%$	The cell shall be charged following the standard charge method. And then the cell shall be stored for 2 hours at 55℃±2℃ followed by a discharge at 0.2C to 2.75V at this temperature; Then cell shall be allowed to cool to room temperature for one hour, followed by standard charging. And then the cell shall be stored for 4 hours at -10℃ ±2℃ followed by a discharge at 0.2C to 2.75V at this temperature; The discharge capacities of different temperature shall be recorded. The capacity of the cell at each temperature shall be compared to the capacity achieved at 25 ℃ and the percentage shall be calculated. 电芯按照标准充电方式充满电后，于 55℃±2℃温度条件下存放 2 h 后，在该温度下以 0.2C 放电至 2.75V； 然后电芯按照标准充电方式充满电后，于-10℃±2℃温度条件下存放 4 h 后，在该温度下以 0.2C 放电至 2.75V； 记录不同温度条件下的放电容量。电芯在不同温度下的放电容量与 25℃时的放电容量进行比较，计算容量百分比。
5.4.4	Storage performance 存储性能	The discharge time of 0.2C_5A: Storage 3 months of battery≥4.5h; Storage 6 months of battery≥4.25h; Storage 12 months of battery≥4h. 0.2C_5A 放电时间 贮存 3 个月的电池≥4.5h； 贮存 6 个月的电池≥4.25h； 贮存 12 个月的电池≥4h。	Charged to the voltage of 3.80 ± 0.02V, before storage, measured the initial condition and initial capacity of battery. Store for 3 months, 6 months, 12 months at a 20℃±5℃ and 45%-75% RH chamber, measured the final condition of battery. Then conduct 0.5 C5A /0.2 C5A cycle for 5 times to record the discharge time of the battery. 测量电池的初始容量，电池充电至 3.80±0.02V 后，测量电池存储前的初始状态，在温度 20℃±5℃相对湿度 45%-75%的环境下分别贮存 3 个月、6 个月、12 个月后，测量电池的最终状态,然后以 0.5C/0.2C 循环 5 次记录电池的放电时间。

5.5 Environmental characteristics 环境适应性能

NO. 序号	ITEM 测试项目	CRITERION 性能标准	TESTING METHOD 测试条件与方法
5.5.1	Vibration 振动性能	No fire, no explosion and no leakage 不起火，不爆炸，不漏液	After standard charge, the cell is to be attached to a vibration table and tested under the following conditions: The Sine Wane is applied to the vibration test. The testing frequency is from 7 Hz to 200 Hz, then returns to 7 Hz with a total sweeping time of 15 min by the logarithm scanning method. The logarithm scanning method: 7 Hz~8 Hz with the acceleration of 9.8 m/s2, keep amplitude of 0.8mm to the acceleration of 78.4 m/s2(50 Hz), and then keep the acceleration of 78.4 m/s2 to 200 Hz frequency. Direction: the cell is to be tested in three mutually perpendicular to X/Y/Z axis for total 3 h, every direction repeat 12 times. Test the open circuit voltage of cell. 电芯按标准充电制式充电结束后，将电池固定在振动台上，不可使电池变形，采用正弦波进行振动，并以对数扫频方式在 15 min 内从 7Hz 扫频到 200 Hz 并返回到 7 Hz，振动沿样品互相垂直的 3 个方向（其中一个方向必须与样品正负极所在平面垂直）进行，每个方向按上述扫频方式重复 12 次，振动 3 h。测量电芯开路电压。对数扫频方式如下：7 Hz～18 Hz 保持 9.8 m/s2 的峰值加速度，将振幅保持在 0.8 mm（位移为 1.6 mm）直至峰值加速度到 78.4 m/s2（频率约为 50Hz），保持 78.4 m/s2 的峰值加速度直到频率增长到 200 Hz。
5.5.2	Drop 跌落性能	No fire and no explosion 不起火，不爆炸	Standard charge. Then let it self fall off from a height of 1m(the lowest height) to a smooth hardwood with the thick of 20mm. The two end faces are respectively dropped once, and the cylindrical surface is dropped twice. Test the open circuit voltage of cell. Keep 1 h. 电池端子向下从 1 m 高度处自由跌落到水泥地面上，端面各跌落一次，圆柱面跌落两次；测量电芯开路电压。观察 1 h。
5.5.3	Static Low Pressure 低气压	No fire, no explosion and no leakage 不起火，不爆炸，不漏液	After standard charge, cell is to be placed in the vacuum oven with a temperature of 25±0.5℃. The inner pressure will be decreased to less than 11.6KPa and keep 6 h. Test the open circuit voltage of cell. 电芯按标准充电制式充电后，将其搁置在温度为 25±0.5℃的真空箱中，真空箱密闭后，逐渐减少其内部压力至低于 11.6KPa（模拟海拔 15240 米）并保持 6 h。测量电芯开路电压。
5.5.4	Temperature cycling 温度循环	No fire, no explosion and no leakage 不起火，不爆炸，不漏液	After standard charge, cell is to be placed in the constant temperature oven. The inner temperature of oven should be set up as the following table and testing will be repeated 10 times. Test the open circuit voltage of cell. Keep 1 h. 电芯按标准充电制式充电后，在室温下稳定后放入温度箱中，温度箱温度按照下表进行调节，循环次数 10 次；测量电芯开路电压。观察 1 h。

Temperature 温度（℃）	Time speed 时间增量（min）	Total time 累计时间（h）
20±5℃	0	0
75±2℃	30	6
-40±2℃	30	6
75±2℃	30	6

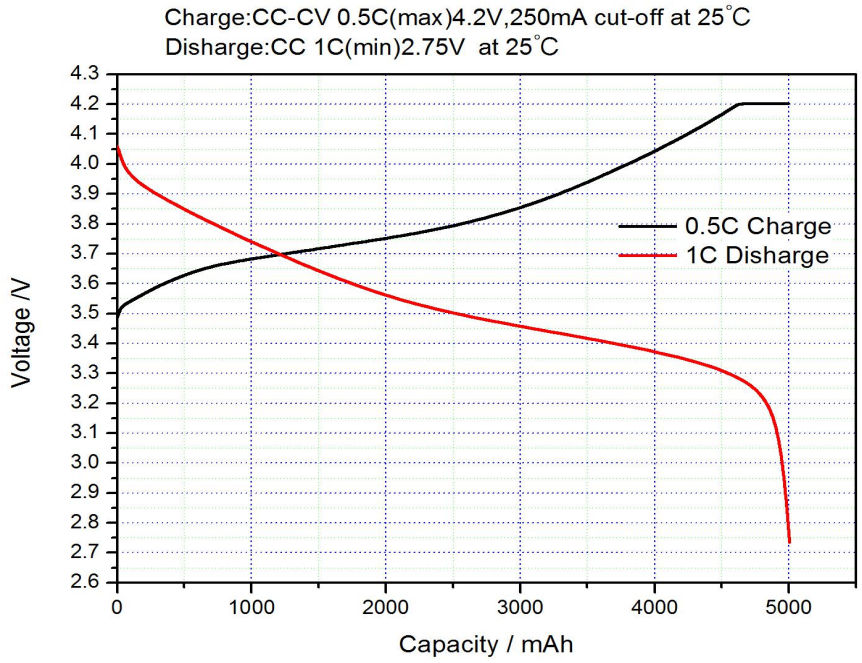
5.6 Safety characteristics 安全性能

NO. 序号	ITEM 测试项目	CRITERION 性能标准	TESTING METHOD 测试条件与方法
5.6.1	Overcharge 过充	No fire, No explosion 不起火、不爆炸	After standard discharge, the cell is to be charged to 4.6 V at 3 C1 current and continues to charge at the voltage until one of the following situations occur: ①the cell temperature is 20% less than the peak temperature; ② the test time reaches 7 hours. 电芯按标准放电至截止电压，然后以 3C1 恒流充电到指定电压 4.6V，转为恒压充电，当出现以下情况之一时终止测试，① 电芯的温度比峰值温度低 20%；② 总测试时间达到 7 h。
5.6.2	Over Discharge 过放性能	No fire, No explosion 不起火、不爆炸	After standard discharge, the cell is to be reverse charged at 1C1 for 90 min. 电芯按标准放电制式结束后，以 1C1 的电流反向充电 90 min。
5.6.3	130 ℃ hot oven 130℃热箱	When the temperature of the cell is 150℃. Cell must not fire or explode in 30 minutes 电芯表面温度达到 130℃后的 30 分钟内，电芯不起火、不爆炸	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±2℃ 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 minutes or until a fire or explosion is obtained, whichever comes first. Record the time that the cell temperature reaches 130℃ and the time when a fire or explosion occurs. 电芯按照标准充电方式充满电后，将电芯放进热箱里，然后将热箱按 5℃±2℃/min 升温到 130℃，当电芯的温度也达到 130℃时，电芯在热箱 130℃环境下保持 30 分钟或者电芯起火爆炸为止。记录电芯温度升至 130℃起直到电芯起火或爆炸的时间。
5.6.4	Crush 挤压	No fire、No explode 电芯不起火、不爆炸	After standard charge, cell is to be crushed with its longitudinal axis parallel to two flat surfaces. The force between the two flat surfaces is 13 KN±0.78 KN. The test will be continued until the maximum force is achieved. And during the test, the cell can not be short-circuited. 电池按规定制式充满电后，将其置于两个平面内，垂直于极板方向进行挤压，两平板间施加 13 KN±0.78 KN 的压力，当压力达到最大值时即可停止试验，实验过程中电池不能发生外部短路。
5.6.5	Short circuit 短路	No fire, No explosion and the highest temperature less than 150℃ 不起火、不爆炸、最高温度不超过 150℃	After standard charge, cell is in the environment of 20 ℃±5 ℃ or 55℃±5℃ until the surface temperature of the battery reaches 20 ℃±5 ℃ or 55℃±5℃, and then the battery is placed for another 30 minutes. Then, connect the positive and negative ends of the battery with an 80mΩ±20mΩ wire . The cell is continuously short-circuited until the following situations occur: ① the cell temperature is 20% less than the peak temperature; ② the test time reaches 24 hours. 电芯按标准充电制式充电结束后，放置在环境温度 25℃±5℃或 55℃±5℃的条件下，待电池表面温度达到 25℃±5℃或 55℃±5℃，再静置 30 分钟；于防爆箱内用电阻 80±20mΩ 导线将电芯正负极短接，试验过程中关注温度变化，当出现以下情况时，终止测试：①电芯外壳中心温度比峰值温度低 20%；② 总的测试时间达到 24 h。

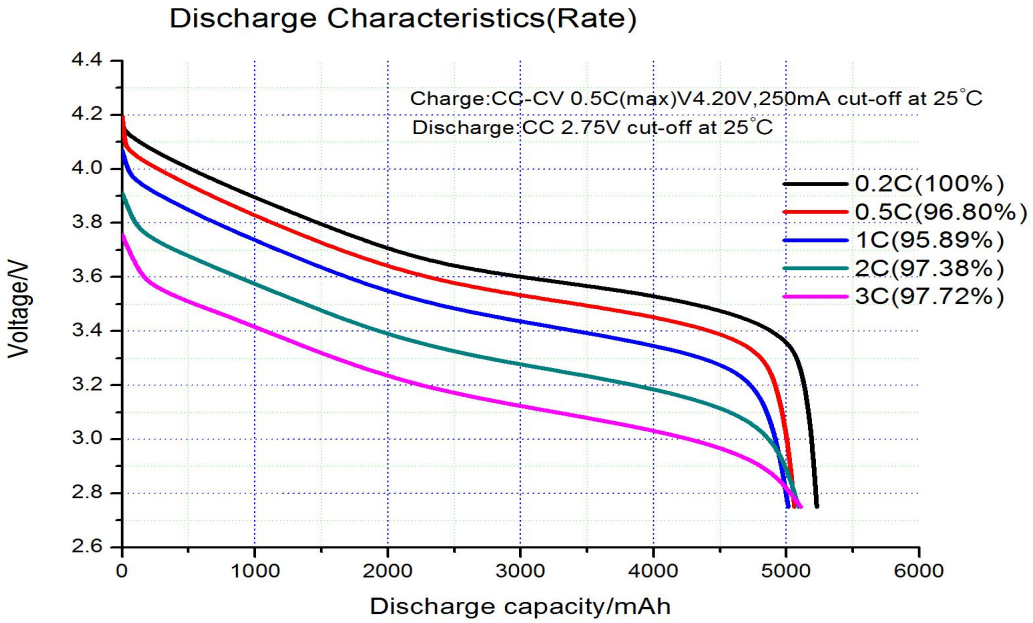
5.6.6	Impact 重物冲击	No flame、No fire、No explode 电芯不冒烟、不起火、不爆炸	After standard charge, the cell is to be placed on a flat surface. A 15.8±0.2 mm diameter bar is to be placed across the center of the cell. A 9.1±0.1 kg hammer is to be dropped on the cell from a height of 610mm ±25mm. Keep 6 h. 电芯按标准充电制式充电后，将电芯置于冲击台面上，将一根 Φ15.8mm±0.2 mm 的钢柱置放于电芯中心，钢柱的纵轴垂直于电芯的纵轴，让重量 9.1kg±0.1 kg 的重锤自 610mm±25mm 高度自由落下，冲击电芯。观察 6 小时。
Note 备注	All above safety tests will be conducted at 25℃±2.5℃ except where specified differently. Use proper ventilation with protective equipment. 除特殊说明，以上所有安全测试均应在 25℃±2.5℃通风橱中，且附带有保护装置的条件下进行。		

5.7 Characteristic Curve 特征性曲线图

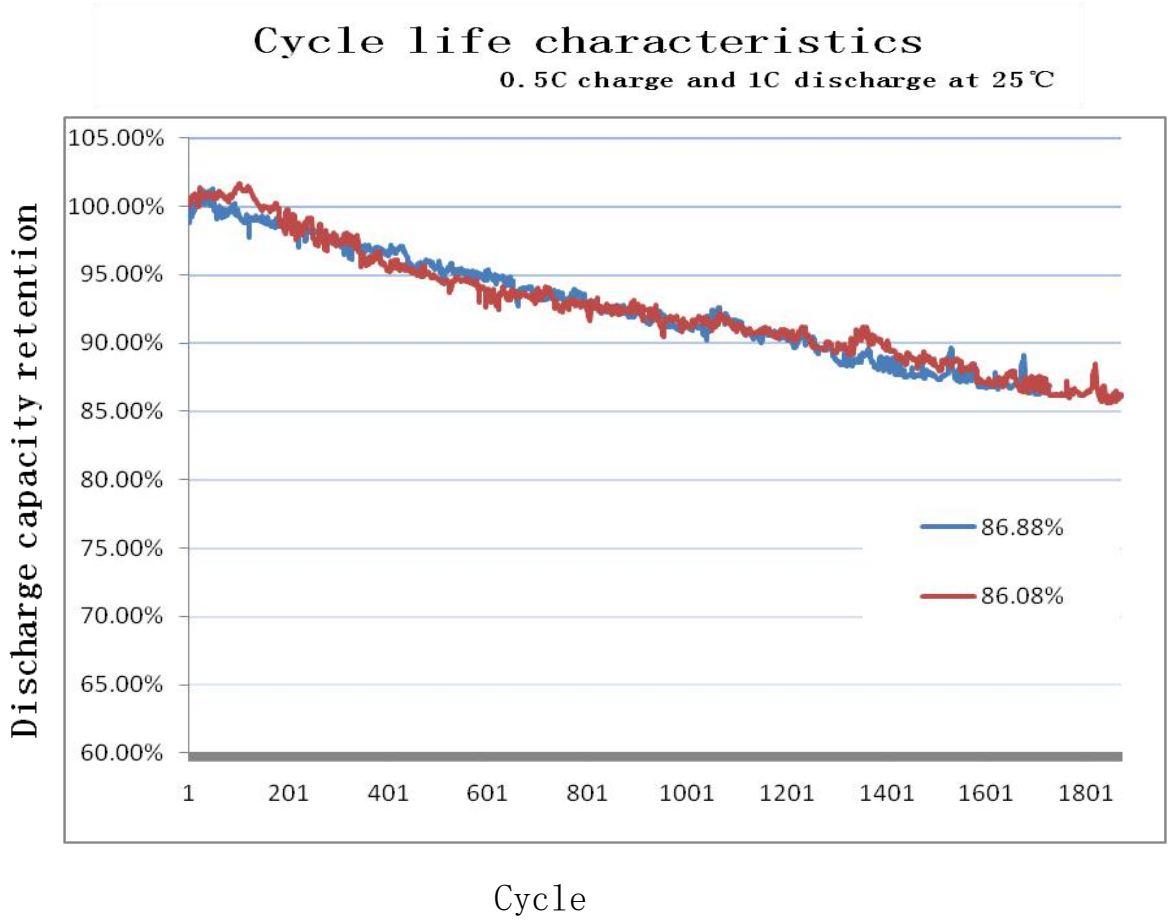
5.7.1 Charge and Discharge Characteristics 充放电性能



5.7.2 Rate Discharge Characteristics 倍率放电性能



5.7.3 Cycle Life 循环寿命



6 List of major parts and components 主要零部件列表

Spare parts 零部件	Material science 材料	Remarks 备注
Positive electrode 正极	Lithium nickel cobalt manganate 镍钴锰酸锂	
Negative pole 负极	Graphite 石墨	
Diaphragm 隔膜	PE+ Ceramics 陶瓷	
Housing 壳体	Steel shell 钢壳	
Cap 盖帽	With explosion-proof valve 带防爆阀	
Electrolyte 电解液	Organic system 有机体系	

7 Warning and cautions in handling the lithium-ion cell
电芯使用时警告事项及注意事项

To prevent the possibility of the cell from leaking, heating, explosion, please observe the following precautions:
为防止电芯可能发生泄露，发热，爆炸，请注意以下预防措施：

- Don’t immerse the cell in water.
- 严禁将电芯浸入水中，保存不用时，应放置在阴凉干燥的环境中。
- Don’t discard the cell in fire or heater; don’t use and leave the cell near a heat source such as fire or heater.
- 禁止将电芯丢入火或加热器中；禁止将电芯在热高温源旁，如火，加热器等旁边使用和留置。
- When charging, use a cell charger specifically for that purpose,don’t charge the reversely
- 充电时请选用锂离子电芯专用充电器,不要正、负极反接充电。
- Don’t reverse the positive and negative terminals; don’t connect the positive and negative terminal

directly with metal objects.

- 严禁颠倒正负极后使用电芯；禁止用金属直接连接电芯正负极，造成短路。
- Don’t connect the cell to an electrical outlet directly.
- 严禁将电芯直接插入电源插座。
- Don’t transport and store the cell together with metal objects such as necklaces, hairpins.
- 禁止将电芯与金属，如发卡、项链等一起运输或存储。
- Don’t strike, throw or trample the cell.
- 禁止敲击，抛掷或踩踏电芯等。
- Don’t directly solder the cell.
- 禁止直接焊接电芯。
- Don’t pierce the cell with a nail or other sharp object.
- 禁止用钉子或其它利器刺穿电芯。
- Don’t leave charge or use the cell in a car or similar place where inside of temperature may bever60℃。
- 在温度可能超过 60℃的地方充电或者使用车中的电芯时，请不要离开。

Caution 小心

- If the cell leaks and the electrolyte get into your eyes, don’t wipe eyes, instead, thoroughly rinse the eyes with clean running water for at least 15 minutes, and immediately seek medical attention. Otherwise, eyes injury can result.
- 如果电芯发生泄露，电解液进入眼睛，请不要搓揉，应用清水冲洗眼睛，必要时请立即前往医院接受治疗，否则会伤害眼睛。
- If the cell gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during usage, recharging or storage, immediately remove it from the device or cell charger and stop using it.
- 如果电芯发出异味，发热，变色，变形或使用、存储、充电过程中出现任何异常现象，立即将电芯从装置或充电器中移开并停用。
- In case the cell terminals get dirty, clean the terminals with a dry cloth before use.
- 如果电芯弄脏，使用前应用干布抹净。
- When charging, use a battery charger specifically for that purpose.
- 充电时请选用锂离子电池组专用充电器。
- Don’t throw the battery into the fire
- 不要把电池组扔到火中。
- Charging method is Constant Current-Constant Voltage(CC/CV)。Charging should be operating under stand charge current and maximum charge voltage which specified in the product pecification
- 充电方式是恒流恒压充电，充电应在规格书要求下，以标准充电电流和最大的充电电压下进行。
- Discharging method method is Constant Current Discharging should be operating under stand discharge current which is specified in the product specification
- 放电方式是恒流放电，放电应在规格书的要求下，标准放电的方式放电。

8 The restriction of the use of hazardous substances 有害物质控制要求

This model of lithium-ion cell is in accordance with our company’s request of ″ Green product management procedures ″.

本型号锂离子电芯符合本公司“绿色环保产品管理程序”要求！

9 Contact information 联系方式

If you have any questions regarding the cell, please contact the following address:

如有疑问，请按以下地址联系：

Headquarter: Fazhan Road No 1 , Jizhou Industrial Park, Ji’an City, Jiangxi Province

厂址：江西省吉安市吉州区工业园区发展大道1号

10 Version change record 修改记录

Serial Number 序列号	Change item 修改项目	Change Content 修改内容	修改人 PIC	修改日期 Date
A0	无	初次发行	无	无
A1	8 有害物质控制要求	本型号锂离子电芯符合本公司“绿色环保产品管理程序”要求！	胡志华	2020-11-25
	5.5.2 跌落测试	电池端子向下从 1 m 高度处自由跌落到水泥地面上，每个面各两次；测量电芯开路电压。观察 1 h。		
	5.6.1 过充测试	电芯按标准放电至截止电压，然后以 3C1 恒流充电到指定电压 4.6V，转为恒压充电，当出现以下情况之一时终止测试，① 电芯的温度比峰值温度低 20%；② 总测试时间达到 7 h。		
A2	5.5.2 跌落测试	按国标修订跌落测试，端面各一次，圆柱面跌两次	胡志华	2020-12-21
A3	命名变更	26650 5000mAh 更改为 26650-5000mAh	胡志华	2021-2-2