

# Product specification

## 产品规格书

Customer/客户: Ciel Light

Model/型号: 503040-500mAh-3.7V

电池属性: 高温电池 低温电池 倍率电池 常规电池

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### 客户名称/印章:

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## 1. Scope 适用范围

This specification describes the basic performance, technical requirement, testing method ,warning and caution of the Li-ion Polymer rechargeable battery pack, the pack defined in this documentation is an assembly which include battery, PCM and wire, the specification only applies to Shen zhen Da zheng energy co. LTD.

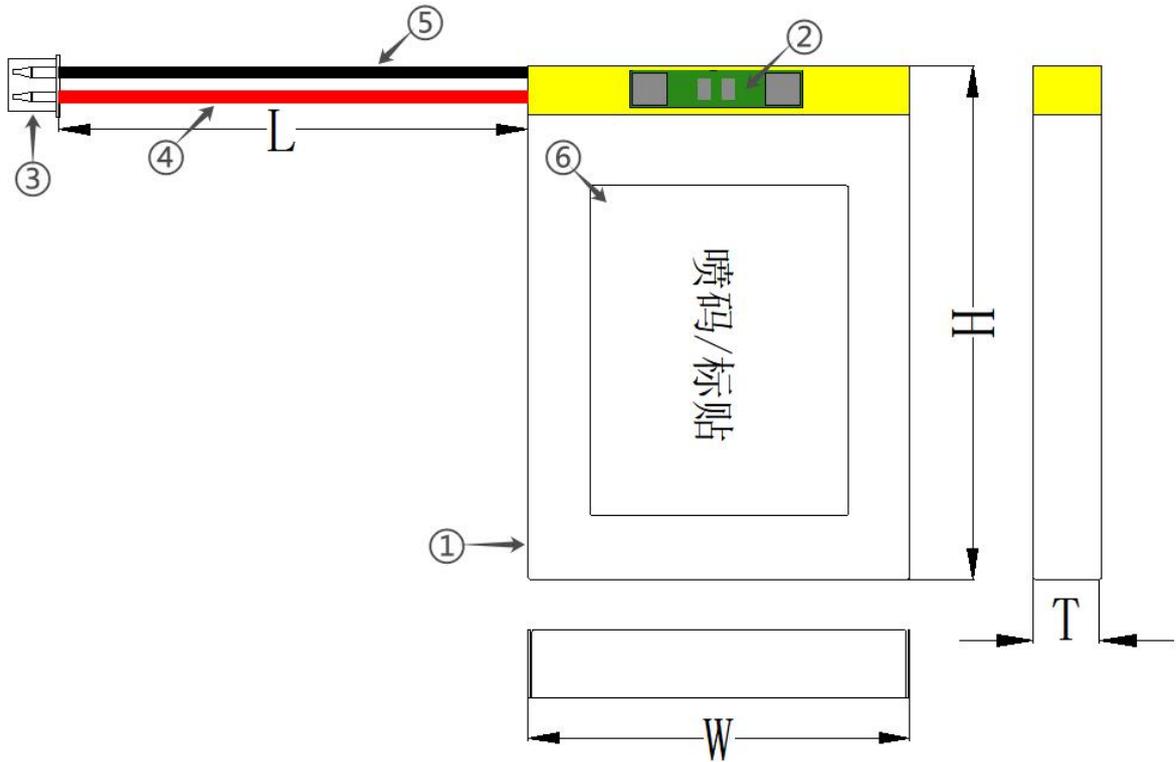
本标准规定了锂聚合物可充电电池的基本性能、技术要求、测试方法及注意事项，电池组合定义的是包括电芯，保护板和连接线的组合，本标准只适用于由深圳市大正能源有限公司生产的聚合物锂离子电池。

## 2. Model 型号: 503040 普通加板

## 3. Basic Product Characteristics 产品基本特性

No.序号	Item 项目	Characteristic 特性
3.1	Nominal Capacity 标称容量	500mAh
3.2	Nominal Voltage 标称电压	3.7V
3.3	Impedance 内阻	≤160mΩ (23±2°C)
3.4	Limited Charge Voltage 充电限制电压	4.20V
3.5	Discharge Cut-off Voltage 放电终止电压	2.75V
3.6	End-of-Charge Current 充电截止电流	0.02 C
3.7	Standard Charge 标准充电	0.2C (100mA) CC(constant current) charge to Charge Limited Voltage, then CV(constant voltage) charge till charge current decline to End-of-Charge Current at 23±2°C. 23±2°C下, 0.2C (100mA)恒流充电至充电限制电压, 然后恒压充电至截止电流。
3.8	Standard Discharge 标准放电	0.2C (100mA) discharge to the Discharge Cut-off Voltage at 23±2°C. 0.2C (100mA)恒流放电至放电终止电压 (环境温度: 23±2°C) .
3.9	Maximum Charge Current 最大充电电流	0.5C (250mA)
3.10	Maximum Discharge Current 最大放电电流	0.5C (250mA)
3.11	Operating Temperature Range 工作温度范围	Charge 充电 0 ~ 45°C
		Discharge 放电 -10 ~ 55°C
	Storage temperature range 储存温度范围	-10 ~ 45°C≤1month; -10 ~ 30°C≤3months; -10 ~ 25°C≤6months
3.12	Operating and Storage Humidity Range 工作和储存湿度范围	45~75% RH

4. External Dimension 外形尺寸



No. 序号	Part Name 类目	Description 型号规格	Remark 备注
T	厚度 Thickness	5.5mm Max	
W	宽度 Width	30.5mm Max	
H	长度 Length	43mm Max	
L	导向外露长度 Guide length	50mm±5mm	
①	电芯 Cell	503040-500mAh	
②	保护板 PCM	XBL-2238 (DW01+8205)	
③	端子 Terminal	1.25-2P 正向	
④	红色导线 Red wire	1571 24#	
⑤	黑色导线 Black wire	1571 24#	
⑥	喷码/标贴 Spray code/ Label	指定标签内容	KC 认证

5. Appearance 外观

电池表面无划伤、裂纹、污渍、变形、漏液等等影响电芯常规性能的缺陷存在。

It shall be free from any defects which may affect commercial value of the cell such as remarkable scratches, cracks, deformation, leakage.

6. Basic Electrical Characteristics 基本电性能

No. 序号	Items 项目	Criteria 标准	Test Method 测试方法
6.1	Open Circuit Voltage 出厂电压	3.75V ~ 4.20V	Measure with voltmeter. 使用电压表进行测量。
6.2	Rated Capacity 额定容量	500mAh (电芯)	Standard Discharge after Standard Charge and rest 10min. 电池标准充电后静置 10 min 再标准放电。
6.3	0.2C Discharge Capacity 0.2C 放电容量	$\geq 98\% \times \text{Rated Capacity}$ $\geq 98\% \times \text{额定容量}$	0.2C discharge to the Discharge Cut-off Voltage after Standard Charge and rest 10min. 电池标准充电后静置 10 min 再 0.2C 放电
6.4	Temperature Characteristics 温度特性	放电容量: 55°C: $\geq 85\% \times \text{额定容量}$ ; 0°C: $\geq 80\% \times \text{额定容量}$ ; -20°C: $\geq 60\% \times \text{额定容量}$ . Discharge Capacity: 55°C: $\geq 85\% \times \text{Rated capacity}$ ; 0°C: $\geq 80\% \times \text{Rated capacity}$ ; -20°C: $\geq 60\% \times \text{Rated capacity}$	After Standard Charge, the cell is stored at $-20 \pm 2^\circ\text{C}$ for 4hours, and then at the same temperature 0.2C discharges to the Discharge Cut-off Voltage. According to this procedure, test $0 \pm 2^\circ\text{C}$ , $55 \pm 2^\circ\text{C}$ discharge capacity, respectively. 将标准充电的电池放在 $(-20 \pm 2)^\circ\text{C}$ 下搁置 4h, 然后再在相同温度下以 0.2C 放电至终止电压, 测试该温度下的放电容量。按照此流程, 再测试 $(0 \pm 2)^\circ\text{C}$ 、 $(55 \pm 2)^\circ\text{C}$ 下的放电容量。
6.5	Storage Characteristics 荷电保持能力	Retention Capacity: $\geq 85\% \times \text{Rated Capacity}$ 剩余容量 $\geq \text{额定容量} \times 85\%$	After Standard Charge, the cell is stored for 28 days, and then 0.2C discharges to the Discharge Cut-off Voltage to test retention capacity. 将标准充电的电池搁置 28 天后, 以 0.2C 恒流放电至终止电压以测试剩余容量。
6.6	Cycle Life 循环寿命	Discharge Capacity(200th cycle) $\geq \text{Rated Capacity} \times 80\%$ 放电容量 (200 次循环) $\geq \text{额定容量} \times 80\%$	A cycle is defined as a Standard Charge, 10 minute-rest and Standard Discharge. The cell is to be cycled for 200times. 一个充放电循环被定义为: 电池标准充电后, 静止 10min, 然后标准放电。按照此定义将电池循环 200 次。

注一 本规格书中提到的所有测试, 如无特殊说明均在  $23 \pm 2^\circ\text{C}$ 、标准大气压力下进行。

Remark 1: All tests mentioned in this specification should be tested at  $23 \pm 2^\circ\text{C}$  and the standard air pressure.

7. Safety Characteristics 安全特性

No 序号	Items 项目	Criteria 标准	Test Method 测试方法
7.1	Overcharge 过充性能	No fire. No explosion. 电池不起火、不爆炸。	0.2C CC charge to 4.8V after Standard Discharge, then CV Charge till current decline to End-of-Charge Current or CV time is more than 7hours. 电池标准放电后, 以 0.2C 电流充电至 4.8V, 然后再在 4.8V 下恒压充电 7h。
7.2	Short-Circuit 短路性能	No fire. No explosion. The temperature of the cell shall not exceed 150°C . 电池不起火、不爆炸, 表面温度最高不超过 150°C。	Rest for 30minutes at 60±2°C after Standard Charge, then short-circuit cells by connecting the positive and negative terminals with a circuit load having a resistance load(copper wire) of 80±10mΩ.Test can be terminated when cell surface temperature has returned to ±10°C of environment temperature. 电池标准充电后, 将电池在(60±2)°C的温度下恒温 30min, 然后用铜导线 (总电阻 80±10mΩ) 短接其正负极, 当电池表面温度恢复至高于环境温度 10°C以内时, 结束实验。
7.3	Heating 过热性能	No fire. No explosion. 电池不起火、不爆炸	The cell is to be heated in a gravity convection or circulating air oven after Standard Charge. The temperature of the oven is to be raised at a rate of 5±2°Cper minute to a temperature of 130 ±2°C and remain for 10 minutes. 将标准充电后的电池放入鼓风式烘箱内, 以(5±2)°C/min 的速率由室温升温至(130±2)°C, 并在此温度下恒温 10min。

注二 所有安全实验须由熟悉锂电池安全实验的专业人员进行,或在实验前请详细咨询我司, 在我司技术人员的指导下进行。  
Remark 2: All safety characteristics are carried out by specialized personnel familiar with Li-ion knowledge or under instruction of our technical personnel after detailed consultation.

**8. Reliability Characteristics 可靠性特性**

No 序号	Items 项目	Criteria 标准	Test Method 测试方法
8.1	Static Humidity and Temperature 恒定湿热性能	Retention Capacity: ≥80%× Rated Capacity Recoverable Capacity ≥85% ×Rated Capacity 剩余容量≥初始容量×80%; 恢复容量≥初始容量×85%; No deformation. No rupture. No smoke. No leakage. 无明显变形、冒烟或破裂, 不漏液。	After Standard Charge, the cell is stored at 40 ± 2 °C and 90%-95%RH for 48hours, then rest for 2hours at 23 ± 2 °C . Standard Discharge to test its retention capacity, and hen perform a cycle with Standard Charge and Standard Discharge procedure to test recoverable capacity. 电池标准充电后, 在温度为(40±2)°C, 相对湿度为90%~95%的条件下开路搁置 48h, 然后在室温条件下开路搁置 2h, 目测外观; 标准放电至终止电压, 记录剩余容量; 然后电池进行一次标准充放电循环测试可恢复容量。
8.2	Vibration 振动	OCV≥3.6V; 电压≥3.6V; No fire. No explosion. 电池不起火、不爆炸。	After Standard Charge, the cell is fixed to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz an 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes. 将标准充电后的电芯固定在振动台上, 沿 X、Y、Z 三个方向各振动 30 分钟, 振幅 1.6mm, 振动频率为 10Hz~55Hz, 每分钟变化 1Hz。
8.3	Drop 自由跌落	Retention Capacity: ≥90%×Rated Capacity; 剩余容量≥额定容量×90%; No fire. No explosion. 电池不起火、不爆炸。	After Standard Charge, the cell is to be dropped from a height of 1 meter onto board ground for 6 times, then test the retention capacity with Standard Discharge. 将标准充电后的电池从 1.0m 高处自由跌落在到木地板上 6 次; 跌落完成后, 将电池进行标准放电测试剩余容量。

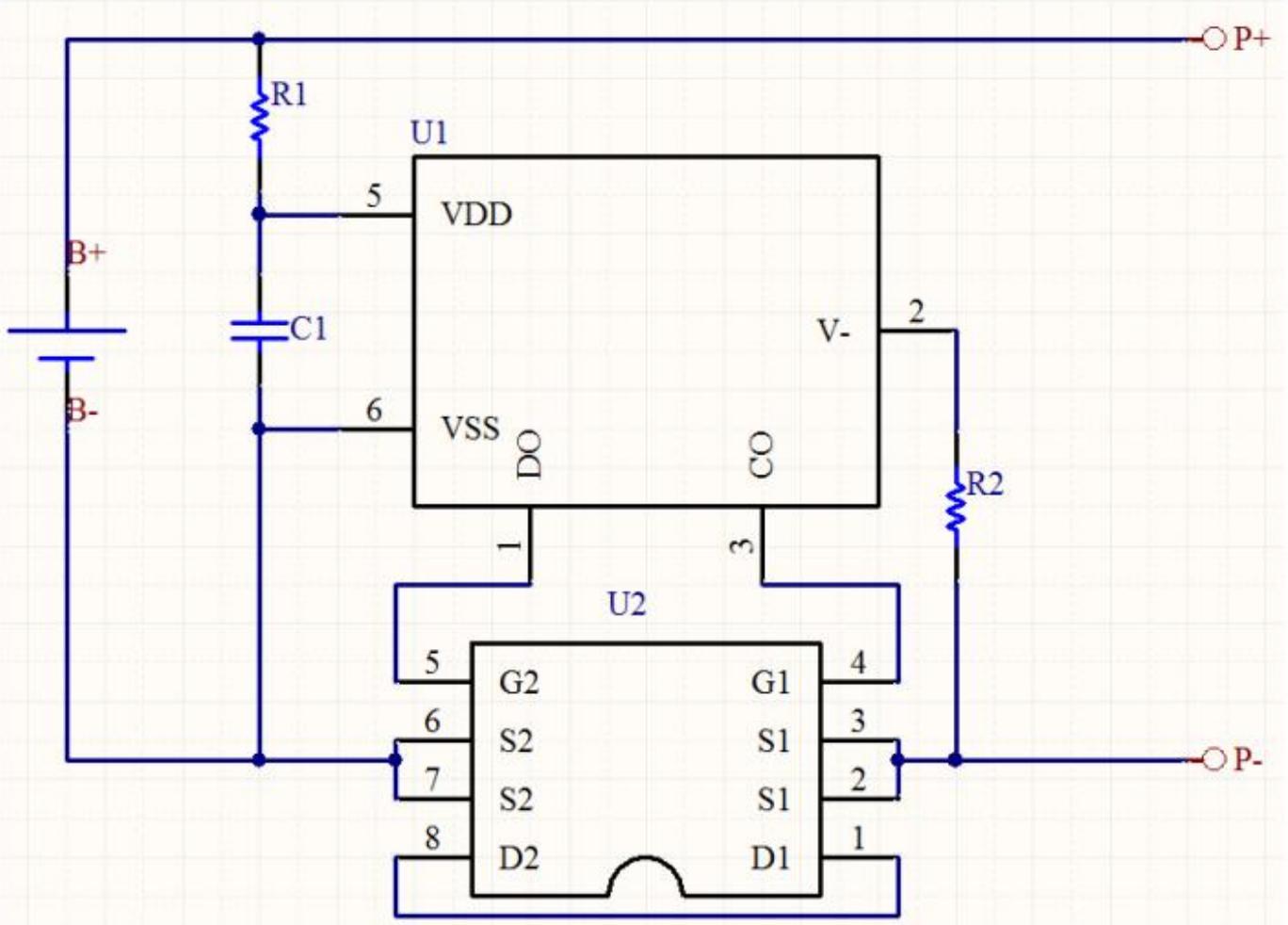
**9. Period of Warranty 保质期**

Period of warranty is 12 months.

保质期为 12 个月。

10. Parameter of PCB 保护板参数

10.1 Circuit Diagram 电气原理图

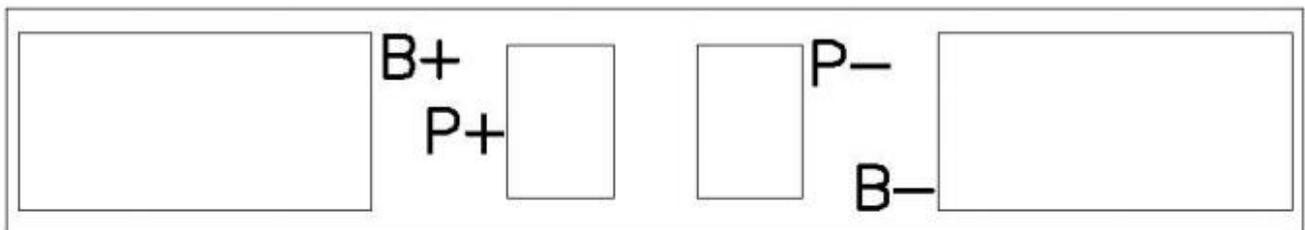
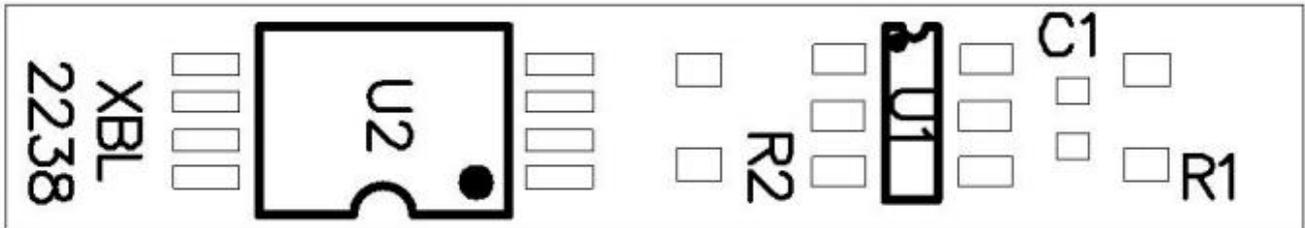


10.2 Electric Features of PCB 保护板技术参数

保护IC:	DW01	参数值 parameter value			
Protection IC:		常温25℃ General temperature 25℃			
项目 item	最小值 Min.	典型值 Type value	最大值 Max.	单位 Unit	
过充保护电压 Over charge protection voltage	4.230	4.300	4.350	V	
过充保护恢复电压 Over charge release voltage	4.030	4.100	4.150	V	
过放保护电压 Over discharge protection voltage	2.300	2.450	2.600	V	
过放保护恢复电压 Over discharge release voltage	2.800	2.950	3.100	V	
放电过流检测电压 Over current detection voltage	0.120	0.150	0.180	V	
充电过流检测电压 Charging Overcurrent Detection Voltage	/	/	/	V	
放电过流保护电流 Over current protection current	2	3.5	5	A	
充电过流保护电流 Charging Overcurrent Protection Current	/	/	/	A	
过充保护延迟时间 Over charge protection delay time		80	200	ms	
过放保护延迟时间 Over discharge protection delay time		40	120	ms	
放电过流保护延迟时间 Over current protection delay time		10	20	ms	
充电过流保护延迟时间 Charging Overcurrent Protection Delay	/	/	/	ms	
短路保护延迟时间 Short protection delay time		50	600	us	
正常状态下静态电流 Current consumption (Operation)		3.0	6.0	uA	
过放状态下静态电流 Current consumption (Power down)			4.0	uA	
导通内阻 Impedance		45	60	mΩ	
输入电压 Input voltage	1.5		5.0	V	
最大持续放电电流 Max continuous discharge current			1.8	A	
最大持续充电电流 Maximum Continuous Charging Current			1.8	A	
工作温度 Operating temperature	-20		+55	℃	
推荐存储条件 Recommendatory storage condition	Temperature range: -5~+35℃ Humidity: 0%~75%RH				
其它功能 Other functions	过放自恢复, 0V启动充电器起始电压1.2V				
0V电池充电功能 0V battery charge function	允许Available				

### 10.3 Parts List of PCB 保护板物料清单

物料名称	品牌	型号/规格	封装	元件编号	数量
贴片电容		0.1 $\mu$ F/+80%-20%	0402	C1	1
贴片电阻		100 $\Omega$ / $\pm$ 5%	0603	R1	1
贴片电阻		1K $\Omega$ / $\pm$ 5%	0603	R2	1
贴片IC		DW01	SOT-23-6	U1	1
贴片IC		8205A	TSSOP-8	U2	1
贴片镍片		6*3*0.3mm		B+, B-	2
PCB		XBL-2238双面板/喷锡	绿油/白字	22*3.8*0.6mm	1



## 11. Matters needing attention 电池使用注意事项

Strictly observes the following needing attention. Future power will not be responsible for any accident occurred by handling outside of the precautions in this specification. 您必须严格遵守下述电池使用注意事项。对于没有按照以下注意事项所造成的任何意外事故我司不负担任何责任。

### ! Danger ! 危险

- Never heat cell or throw it into fire.
  - 严禁把将电池投进火中或进行加热。
- Never throw cell in liquid such as water、gasoline or drink etc, also do not wet cell
  - 严禁把电池投入液体中，如水、汽油、饮料等，也不要把电池弄湿。
- Prohibition of use cell close to fire or in a car where temperature may be above 60°C. Also do not charge / discharge in such conditions.
  - 禁止在火源附近或温度超过 60°C的轿车中使用或遗留电池，也不要这些环境中进行充放电。
- Never put batteries in your pockets or a bag together with metal objects such as necklaces, Hairpins, coins, or screws. Do not store or transport batteries with such objects.
  - 禁止把电池同项链、发夹、硬币或螺钉等金属品一起放在兜中或包中，也不要把电池同上述物品一起储存或运输。
- Never short-circuit the (+) and (-) terminals with other metals.
  - 禁止使用金属导体短路电池的正负极。
- Do not place cell in a device with the (+) and (-) in the wrong way around.
  - 在装入设备时注意电池的正负极不要反装。
- Do not pierce cell with a sharp object such as a needle.
  - 禁止使用锐利的物品刺穿电池。
- Do not disassemble the cell.
  - 禁止对电池进行分解。
- Never weld a cell directly.
  - 禁止直接对电池进行焊接。
- Do not use a damaged cell.
  - 禁止使用已经损坏的电池。
- Please carefully read the user' s manual prior to use to avoid deteriorated performance, even cell leakage, heat, smoke, fire, explosion due to wrong operations.
  - 在使用之前请仔细阅读操作说明书，不适当的操作可能引起电池变热、着火、爆炸、毁坏或电池容量的衰减。
- Do not put cell into a microwave oven, dryer, or high-pressure container.
  - 禁止把电池放加热器皿、洗衣机或高压容器中。
- Never use cell with dry cells and other primary batteries. Also do not use mixed cells/batteries with different package, model, or brand.
  - 禁止把电池同干电池或其它原电池或者新旧电池一起使用，也不要同不同包装、不同型号或不同品牌的电池一起使用。
- Stop charging the cell if charging is not completed within the specified time.
  - 如果在规定的充电时间内充电没有结束，停止充电。
- Stop using the cell if abnormal heat, odor, discoloration, deformation or abnormal condition is detected during use, charge, or storage.
  - 在使用、充电或储存期间如发现电池有变热、散发气味、变色、变形或其它反常之处停止使用。
- Keep away from fire immediately when leakage or unpleasant smell is detected.
  - 当发现电池漏液或散发出难闻的气味时立即远离。
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.
  - 如果电解液渗漏到您的皮肤或衣服上，立刻用大量清水冲洗。

□ If liquid leaking from the cell gets into your eyes, do not rub your eyes. Wash them well with fresh water and go to see a doctor immediately.

- 如果电解液渗出并进入您的眼睛里，不要揉擦您的眼睛，立刻用清水清洗眼睛并就医。

### **! Caution ! 注意**

□ Before using the cell, be sure to read the user' s manual and cautions on handling thoroughly.

- 在使用电池之前，应详细阅读操作指南并对使用中的注意事项有足够深刻的理解。

□ Charge with specific charger according to product specification. Charge with CC/CV model. Reverse charging is prohibited, for it will deteriorate the cell performance and lead to safety issues such as heat and leakage.

- 充电时请使用指定的充电器并按照本规格书的要求进行充电。采用恒流恒压方式充电，禁止反向充电。同时，反向充电会降低电芯的充放电性能和安全性，并会导致发热和泄漏。

□ Keep batteries out of reach of children to avoid being swallowed.

- 把电池放到小孩够不到的地方以免吞服。

□ If children use the cell, their guardians should explain the proper handling.

- 小孩使用电池时，监护人应详细解释操作方法。

□ Batteries have life cycles. If cell powers equipment much shorter time than usual, please replace the cell with a new one.

- 电池具有使用寿命，如果使用电池的设备的工作时间比平常少的多，请更换新电池。

□ When not using cell for long terms, remove it from the equipment and store in a place with low humidity and low temperature.

- 当长期不用时，要将电池从设备中取出并放在低温低湿的环境中保存。

□ While the cell pack is charged, used and stored, keep it away from places/objects with static electric.

- 电池应在远离静电的场所进行充电、使用和储存。

□ If the terminals of cell become dirty, clean it with dry cloth before using.

- 如果电池的接线端变脏，在使用之前用干布擦净。

□ Cell would be over-discharged by its self-discharge characteristics in case the battery is not used for long time. In order to prevent over-discharging, the battery shall be charged periodically to maintain between 3.7V and 3.9V. Cell is to be stored in a condition as Item. 3.11 and 3.12.

- 由于自放电存在，电芯长时间不使用时将会过放；为避免电芯过放，应定期给电芯充电以维持电压在 3.7V 到 3.9V 之间。同时电芯应在 3.11 和 3.12 给定的条件下存贮。