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Specification for Li-Polymer Rechargeable Battery

锂离子聚合物电池规格书

Product Type

产品类型：

成品电芯

Cell Model

电芯型号：

402020

Cell Capacity (mAh)

电芯容量(mAh)：

120

Customer Code

客户代码：

Prepared by 拟制	Checked by 审核	Approved by 批准
陈梁 2025-4-14	谢建锋 2025-4-146	严艳明 2025-4-14

Customer Approval 客户确认	Signature/Date 签字/日期	
	Company Stamp 公司印章	

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1.Product scope 产品范围

This specification describes the technical parameter, testing method and using requirement of Lithium-ion polymer rechargeable battery, which manufactured by **Huizhou Advanced Polymer Battery Technology Co., Ltd.** 。

本标准适用于**惠州市优聚锂电科技有限公司**生产的锂离子聚合物电芯和电池。它描述了相关的技术指标及测试方法和使用要求。

2. Product 产品

2.1 电池型号 Battery Model: 402020-120mAh

2.2 产品描述 Product Description: 2st battery

3 Key parameters 基本参数

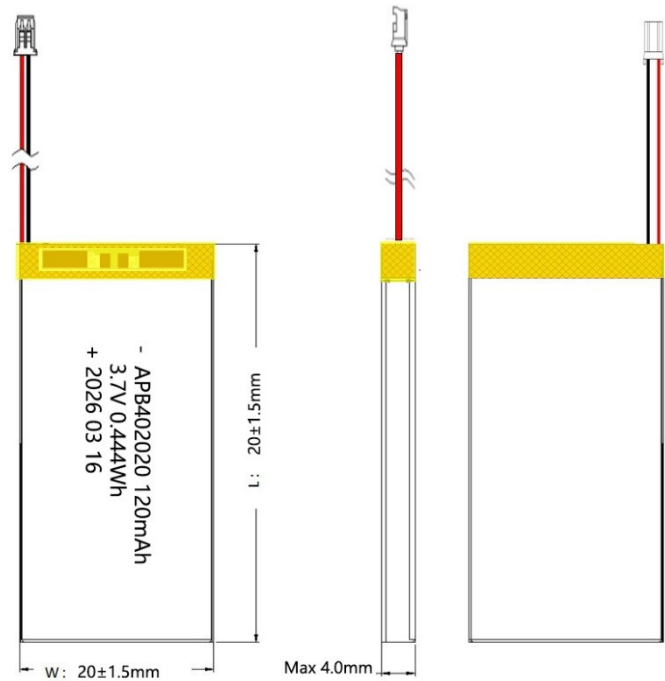
序号 No.	项目 Items	规格 Ratings	备注 remarks		
1	标称电压 Nominal Voltage	3.7V			
2	标称容量 Nominal Capacity (C) 最小容量 Minimum Capacity	120mAh	0.2C 标准充电/0.2C 标准放电 Standard charge 0.2C/ standard discharge 0.2C		
3	倍率容量 Rate Capacity	/	/		
4	电池内阻 Battery Impedance	≤300mΩ	测试条件为半电 AC 1kHz (常温下, 23±3℃) Measured 50% SOC at AC 1kHz (RT)		
5	出货电压 Shipment Voltage	≥3.80V	出厂时的电压 As of shipment		
6	充电限制电压 Limited Charge Voltage	4.2V	充电截止电压 Charge cut-off voltage		
7	最大充电电压 Max.Charge Voltage	4.20 ^{+0.03} _{-0.02} V			
8	标准充电电流 Standard Charge Current	0.2C			
9	最大充电电流 Maximum Charge Current	环境温度 Ambient Temperature	充电电流 Charge Current	充电限制电压 Limited Charge Voltage	恒压截止电流 Cut-off Current of CV
		0° C~+15° C	0.1 C	4.2V	0.01C
		+15° C~+25° C	0.5 C	4.2V	0.02C
		+25° C~+45° C	1C	4.2V	0.02C
10	标准放电电流 Standard Discharge Current	0.2C			
11	最大放电电流 Maximum Discharge Current	1C			
12	放电截止电压 Discharge Cut-off Voltage	3.00V	电池标定截止电压 Battery standard cut-off voltage		
13	工作温度 Operating Temperature	0℃~+45℃	充电 Charge		
		-10℃~+60℃	放电 Discharge		
14	贮存(半电) Storage (50%SOC)	-20℃~+30℃	小于一年 Less than 1 year		
		+30℃~+45℃	小于三个月 Less than 3 months		
		+45℃~+60℃	小于一个月 Less than 1 month		

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4. Battery size 电芯尺寸

Cell physical dimension listed in Figure1 cell drawing(unit: mm, not in scale), The drawing is for reference only.

电池尺寸示意图如图（单位：mm，未按比例制图），此图仅供参考。



The drawing of battery dimension

Items 项目	Description 内容描述	Dimension 尺寸
S	Thickness Max. 电芯最大厚度	4. 0mm
W	Width Max 电芯宽度最大值	20. 0mm
L	Length Max 电芯长度最大值	20. 0mm

5. BOM(Bill of materials) 电池物料清单

NO.	Material Name 零件名称	Specification 规格型号	Qty 用量	Remark 备注
1	Cell 电芯	402020-120mAh/3.7V	1	ROHS
2	MOSFET	8205S/SOT-23-6	1	ROHS
3	Wires 引线	Red Wire 红线 0.8mm	1	ROHS
		Black Wire 黑线 0.8mm	1	ROHS

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6.PCM Specifications/保护板规格

6.1 PCM Part list/保护板元件清单

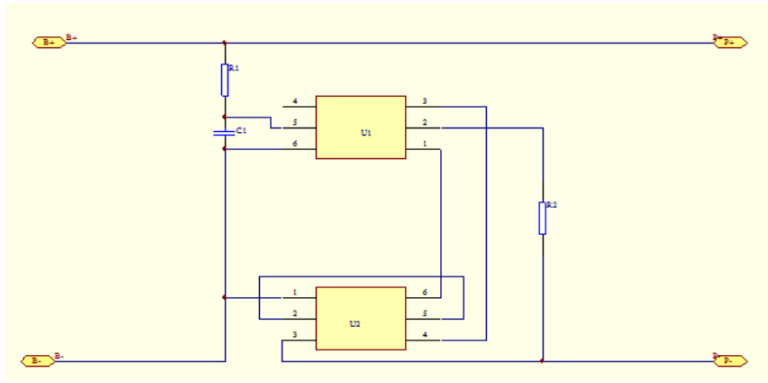
序号	物料名称	物料代号	物料规格	用量	厂商/备注
1	保护 IC	U1	DW01 /S0T-23-6	1	
2	MOSFET	U2	8205S /S0T-23-6	1	
3	贴片电阻	R1	100 Ω $\pm$ 5%/0402	1	
4	贴片电阻	R2	1K Ω $\pm$ 5%/0402	1	
5	贴片电容	C1	0.1 μ F/-20%/+80%/16V/0402	1	
6	印制电路板	PCB	HY-6504	1	

6.2Electrical characteristics 电气特性

序号	项目		符号	检验方法及设备	检验标准			单位
					最小值	典型值	最大值	
1	过充保护	过充电检测电压	V_{CU}	锂电保护板测试仪	4.25	4.30	4.35	V
		过充电检测延迟时间	V_{CU}	锂电保护板测试仪	77	110	143	ms
		过充电解除电压	V_{CL}	锂电保护板测试仪	4.05	4.10	4.15	V
2	过放保护	过放电检测电压	V_{DL}	锂电保护板测试仪	2.425	2.5	2.575	V
		过放电检测延迟时间	T_{DL}	锂电保护板测试仪	38.5	55	71.5	ms
		过放解除电压	V_{DR}	锂电保护板测试仪	2.825	2.9	2.975	V
3	过流保护	过电流检测电压	V_{CHA}	锂电保护板测试仪	0.13	0.15	0.157	V
		过电流保护电流	I_{IOV1}	锂电保护板测试仪	2.0	3.0	5.0	A
		检测延迟时间	T_{IOV1}	锂电保护板测试仪	4.9	7.0	9.1	ms
4	短路保护	检测延迟时间	T_{SHORT}	锂电保护板测试仪	200	400	600	μS
		保护解除条件		万用表	断开外部短路负载或充电恢复			
5	休眠功能	休眠功能			☐ 有 不带过放电自恢复功能 ☒ 无 带过放电自恢复功能			
6	内阻	主回路通态电阻	R_{DS}	锂电保护板测试仪	20	55	65	m Ω
7	消耗电流	通常工作时消耗电流	I_{OPE}	锂电保护板测试仪	/	3.0	6.0	μA
8	静态电流	休眠时消耗电流	I_{PDN}	锂电保护板测试仪	/	/	1.0	μA
9	充电电流	持续充电电流	I_c	直流电源	/	/	0.8	A
10	放电电流	持续工作电流	I_b	电子负载	/	/	0.8	A
11	0V 充电功能	电芯 0V 时的充电功能		直流电源	☒ 有 ☐ 无			
12	存储条件		温度范围：0℃～30℃ 湿度范围：45%～75%RH					
13	存储时间		3 个月					

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6.3 Terminal explanations 典型应用原理图



7. 外观 Visual Inspection

不允许有任何影响电池性能的外观缺陷，如裂纹、裂缝、泄漏等。

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell.

8. Cell definition 电芯定义

8.1 Nominal capacity 标称容量

Nominal capacity, The capacity obtained when a cell is discharged at a 5 hour rate to 3.0 volts at 25 ± 3℃

标称容量，指在 25 ± 3℃环境下，以 5 小时率放电至终止电压 3.0 V 时的容量。

8.2 Standard charge method 标准充电方式

8.2.1 At condition of 15~25℃, charge to 4.20V that is single cell' s voltage at a constant current of 0.5C₅, and then, charge continuously with constant voltage of 4.2V until the charge current drops below 0.02C₅.

在 15~25℃环境下，以 0.5C₅ 的电流恒流充电至单体电芯电压 4.2V 后，转为恒压 4.2V 充电，至充电电流小于 0.02C₅ 时，停止充电。

8.2.2 At condition of 0~15℃, charge to 4.2V that is single cell' s voltage at a constant current of 0.2C₅, and then, charge continuously with constant voltage of 4.2V until the charge current drops below 0.01C₅.

在 0~15℃环境下，以 0.2C₅ 的电流恒流充电至单体电芯电压 4.2V 后，转为恒压 4.2V 充电，至充电电流小于 0.01C₅ 时，停止充电。

8.3 Fast charge method 快速充电方式

The Quick Charge method means charging the Cell at a constant current of 1.0C₅ at 25 ± 3℃ until the voltage is 4.20V, then charge at a constant voltage of 4.2V until its current is less than 0.01C₅.

快速充电即在环境温度为 25℃ ± 3℃ 的条件下，先以恒定电流 1.0C₅ 充电至 4.2V，再以 4.2V 的恒压

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充电至电流小于 0.01C₅。

8.4 Standard discharge method 标准放电方式

At 25 ± 3°C condition, discharge to 3.0V at a constant current of 0.2 C₅.

在 25 ± 3°C 环境下，以 0.2C₅ 的电流恒流放电至电压 3.0 V。

9. Cell technical characteristics 电芯技术要求

9.1 Test condition 测试条件

fresh cells, tested at condition of 25 ± 3°C, 45-85%RH, Atmospheric pressure 86 -106 K Pa, standard charge and discharge unless otherwise specified.

除非有特殊说明，否则所有测试要求为：温度为 25 ± 3°C，湿度 45-85%RH，气压 86-106Kpa，样本为新电芯，充放电制式为标准充电和标准放电。

9.2 Measuring Equipment 测量仪表与设备要求

Requirement of voltage meter: The accuracy is not less than ±0.5%.

测量电压的仪表准确度应不低于±0.5%。

Requirement of ampere meter: The accuracy is not less than ±0.5%.

测量电流的仪表准确度应不低于±0.5%。

Requirement of time meter: The accuracy is not less than ±0.1%.

测量时间用的仪表准确度应不低于±0.1%。

Requirement of thermometer: The accuracy is not less than ±0.5 °C.

测量温度的仪表准确度应不低于±0.5°C。

Constant current resource is constantly adjustable, which alters within ±1%.

恒流源的电流可调，在恒流充电或放电过程中，其电流的相对变化应在±1% 范围内。

Constant voltage resource is constantly adjustable, which alters within ±0.5%.

恒压源的电压可调，在恒压充电过程中，其电压变化应在±1%范围内。

9.3 Electrical characteristics 电性能

No. 序号	Test item 测试项目	Criterion 性能标准	Test Method 测试方法
1	Cycle life 循环寿命	The cycle times is not less than 300 times. 循环次数不小于300次	Test condition is as below: First, charging with constant current of 0.2C ₅ and constant voltage of 4.20V, cut off at 0.02C ₅ ; Then rest 30minutes; Second, Discharging with constant current of 0.2C ₅ to 3.0V Then rest 30minutes;

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			Cycle through the above steps , when the discharge capacity reduced to 80% of C_{min}, stop testing. 测试条件: 首先以0.2C₅恒流恒压充电至4.20V, 截止电流0.02C₅, 然后静置30分钟; 然后以0.2C₅恒流放电至3.0V, 静置30分钟; 以上充放电步骤进行循环, 当放电容量降至C_{min}的80%时, 停止测试。
2	28days Charge retention 28天荷电保持	①Discharging capacity is not less than 85% of initial capacity. 放电容量应不低于初始容量的85%; ②Recovery capacity is not less than 90% initial capacity. 可恢复容量应不低于初始容量的90%。	After Standard Charging, test condition is as below: Temperature: 23±3℃ Storage Time: 28days Then 0.2 C₅discharge to ending voltage, and after standard charging, the cell is discharged by 0.2C₅. Then its recovery capacity is measured at 23±3℃ and calculated with the maximum capacity of 3 times of cycles. 标准充电后, 测试条件如下: 温度: 23±3℃, 搁置时间: 28天; 再以0.2C₅放电至终止电压。然后进行标准充电后, 电池用0.2C₅放电, 在23℃±3℃下测试3周次容量, 以最大值作为可恢复容量。
3	45℃/7 天 45℃/7 days	充满电电池在 45±2℃高温箱中搁置 7 天, 再放电至终止电压 Storage 7 days at 45±2℃ oven after fully charge, then discharge to 3.0V at RT	不起火, 不爆炸, 不冒烟 smoke or no leakage, No fire, no explode, no 容量衰减 < 10%, 内阻增加< 30% Cap loss < 10%, imp increase < 30%
4	Constant temperature and constant humidity test 恒定湿热	No explosion, no fire, no leakage. Discharging capacity is not less than 60% initial capacity 不起火、不爆炸、不泄漏。 放电容量不低于初始容量的60%	After Standard Charging, test condition is as below: Temperature: 40±3℃ Relative Humidity: 90~95%RH Storage Time: 48 hours Then return to room temperature for 2 hours, Then 1C₅discharged to ending voltage 标准充电后, 测试条件如下: 温度: 40±3℃ 相对湿度: 90~95% 放置时间: 48小时 电芯取出在室温下放置2小时, 然后以1C₅电流放电至终止电压。
5	Vibration test 振动	No leakage, no venting, no rupture, no fire, no	The cell is to be fixed on the vibration table so that the cell can' t be deformed. The cell is to be

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		explosion, the open voltage is not less than 90% of initial voltage 电芯开路电压应不低于90%的初始电压，应不泄漏、不泄气、不破裂、不起火和不爆炸	subjected sine vibration motion using logarithmic sweep mode and is to be swept from 7Hz to 200Hz and is to be returned to 7Hz in Within 15min. Three directions (one direction of them must be perpendicular to plane of positive and negative electrode) are to be conducted in each direction at the above logarithmic sweep mode and is to be repeated 12 times. Vibration continues 3h. Logarithmic sweep follows : to maintain the peak acceleration 9.8m/s² in 7Hz ~ 18Hz . Maintained at 0.8mm amplitude (Excursion of 1.6mm) until a peak acceleration of 78.4m/s² (frequency of about 50Hz). To maintain the peak 78.4m/s² increasing acceleration until the frequency to 200Hz. 将电芯固定在振动台上，不可使电芯变形。采用正弦波进行振动，并以对数扫频方式在 15min. 内从 7Hz 扫频到 200Hz 并返回到 7Hz。振动沿样品互相垂直的三个方向（其中一个方向必须与样品正负极所在平面垂直）进行，每个方向按上述对数扫频方式重复 12 次，振动 3h。对数扫频方式如下：7Hz~18Hz 保持 9.8m/s² 的峰值加速度。将振幅保持在 0.8mm（位移为 1.6mm）直至峰值加速度达到 78.4m/s²（频率约为 50Hz）。保持 78.4m/s² 的峰值加速度直到频率增长到200Hz。
6	Shock test 机械冲击	No explosion, no fire, no leakage 不起火、不爆炸，不泄漏。	After Standard Charging , using rigid fixed method (which can be fixed to the support surface of all the cells), the cell is fixed to the core of the electrical test equipment . On each of three mutually perpendicular directions to withstand a shock of equivalent . At least one plane perpendicular to the width of the cells . Each shock is in the following ways: in the first 3ms, the minimum average acceleration of 735 m/s², peak acceleration should be between 1225 m/s² and 1715 m/s², pulse duration is 6ms ± 1ms. 按标准充电后，采用刚性固定的方法（该方法能支撑电芯所有的固定表面）将电芯固定在试验设备上。 在三个相互垂直的方向上各承受一次等值的冲击。至少一个方向垂直于电芯的宽面。每次冲击按下述方法进行：在最初的3ms内，最小平均加速度为735 m/s²，峰值加速度应该在1225 m/s²和1715 m/s²之间，脉冲持续时间为6ms±1ms。

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7	电池温度性能 Temperature Performance of Battery	-10℃: ≥60% 25℃: 100% 50℃: ≥85%	1. According to item 8.2.2, at 25±5℃. 2. Capacity comparison at each temperature, measured with constant discharge current 0.2 C with 2.75V cut-off. Percentage as an index of the capacity compared with 100% at 25℃ 1. 在25±5℃条件下, 用8.2.2方法将电池充电。 2. 在不同温度条件下, 用0.2 C的电流恒流放电至截止电压2.75V。以25℃时放电容量为基准计算百分比。
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9.4 Safety Characteristics 安全性能

No. 序号	Item 项目	Criterion 性能指标	Test Method 测试方法
1	Overcharge test 过充电	No explosion, no fire 不起火、不爆炸	Discharge : 1C ₅ to 3.0V Charge: 3C ₅ A to 4.6V When the temperature falls 10℃ lower than the peak ,Stop testing 放电: 1C ₅ 放电至3.0V 充电: 3C ₅ 充电至4.6V 当温度下降到比峰值低约10℃时, 结束试验。
2	Short-circuit test 短路	No explosion, no fire, the surface temperature of the cell ≤150℃ 不起火、不爆炸	After standard charging, at condition of 55℃±5℃ in short circuit join the positive and negative with copper wire of the resistance of 80mΩ±20mΩ. When the temperature falls lower than 20% of the peak or the circuit time achieves 24 hours, stop testing. 标准充电后, 在55度条件下, 使用总内阻不大于80mΩ的导线短路正负极, 当电池温度下降到比峰值低约20%时, 结束试验。
3	Thermal abuse test 热滥用	No explosion, no fire 不起火、不爆炸	Put cell into an hot box, test condition is as below: Temperature Rate : 5±2℃ /min. Ending temperature : 130±2℃ Keep temperature for 10 minutes, Then stop testing. 将电芯放置于热箱中, 测试条件如下: 升温速率: 5±2℃/min. 终止温度: 130±2℃ 保持此温度10min., 然后停止测试。
4	Over discharge test	No explosion, no fire, no smoke, no leakage 不起火、不爆炸、不冒烟和不	At ambient temperature conditions of 20 ± 5℃, the cell is discharged at 0.2 C ₅ to the termination voltage with joining external load of 10Ω , discharged duration is

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	过放电	漏液	24 hours . 电芯在环境温度 $20\pm5^{\circ}\text{C}$ 的条件下, 以 0.2 C_{50} 电流 放电至终止电压后, 外接 10Ω 负载放电 24 小时。
Note: Above testing of safe characteristics must be with protective equipment. 备注: 以上安全性能实验应在有保护措施的条件下进行。			

10. Shipment and Storage 运输和存储

10.1 运输 transportation

电池应在半荷电状态(40~70%充电状态)下包装成箱进行运输, 如果采用空运, 带电量必须低于 30%SOC。在运输过程中应防止剧烈振动、冲击或挤压, 防止日晒雨淋。

The cell should be packed in cartons under the condition of half capacity (40~70% state of charge) for shipment, and if is transported by air, the state of charge must be less than 30% SOC.

10.2 贮存 Storage

电池贮存应保持原有包装, 存放产品仓库环境温度为 $-5^{\circ}\text{C}\sim+35^{\circ}\text{C}$, 相对湿度不大于 75%的清洁、干燥、通风并设有防潮、防尘、防震、防腐蚀措施的室内, 贮存 6 个月需补电。

The battery should be kept in their original package and stored in a warehouse with ambient temperature in the range between -5°C and $+35^{\circ}\text{C}$, and relative humidity no more than 75%. The battery should be kept indoors in a place that is clean, dry, ventilated and equipped with measures against moisture, dust, vibration and corrosion, 6 months after storage.

11. Period warranty 质量保障

The warranty period of Cell or battery is 12months after the shipment date. However, even though the problem occurs within this period, APB won't replace a new cell for free as long as the problem is not due to the failure of APB manufacturing process or is due to customer's abuse or misuse.

产品的保质期限自出货之日起 12 个月。但是, 在此期限内, 如果非优聚锂能科技有限公司的制程原因或是客户的误用造成的电芯质量问题, 优聚锂能科技有限公司不承诺免费更换。

12. ROHS requirement 有害物质指令要求

This product and all raw materials accord with ROHS requirement.

本产品及其所使用的原材料符合 ROHS 要求。

13. Liability 产品责任

Please use the Lithium ion battery supplied by Huizhou Advanced Polymer Battery Technology Co., Ltd. under the product specification .It may cause fire or expansion if the cells are used incorrect .We will not guarantee the safety unless the battery is used under the product specification.

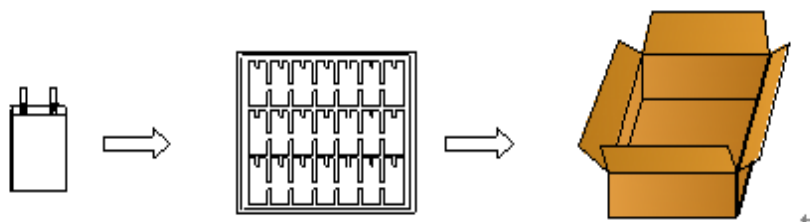
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请客户务必按照所提供的规格说明书和所附的注意事项来使用惠州市优聚锂能科技有限公司生产的电池。不正确的使用电池，可能会导致电池性能异常、发热、着火或破裂现象。对于客户在超出规格说明书以外的情况下使用电池，惠州市优聚锂能科技有限公司不保证其使用性能和安全性能。

14. Packing Instruction 包装说明

The photo, size and color of the mark are all comply with the requirement of GP/T 191-2000.

标志的图形、尺寸、颜色应符合 GP/T 191-2000 的要求



15. Warning and cautions in handling the lithium-ion cell 警告及注意事项

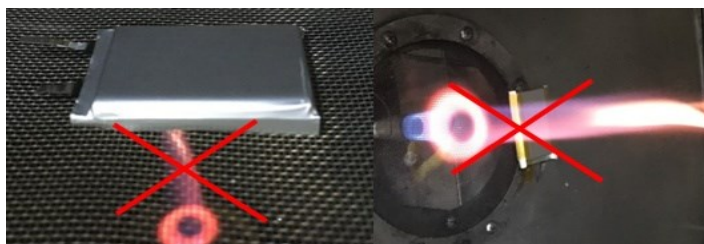
- To prevent the possibility of the cell from leaking, heating, explosion, please observe the following precautions:

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 battery in water and seawater. Please put it in cool and dry environment if no using.

严禁将电池浸入海水或水中，保存不用时，应放置在阴凉干燥的环境中。

- Don't use and leave the cell near high temperature heat source, such as fire or heater. 禁止将电芯在高温热源旁，如火，加热器等旁边使用和留置。



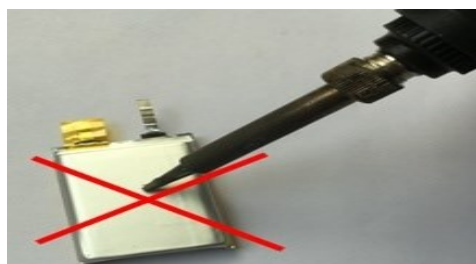
- Don't reverse the positive and negative terminals. 严禁颠倒正负极后使用电芯。
- Don't connect the cell to an electrical outlet directly. 严禁将电芯直接插入电源插座。
- Don't discard the cell in fire or heater. 禁止将电芯丢入火或加热器中。
- Don't connect the positive and negative terminal directly with metal objects. 禁止用金属直接连接电芯正负极，造成短路。

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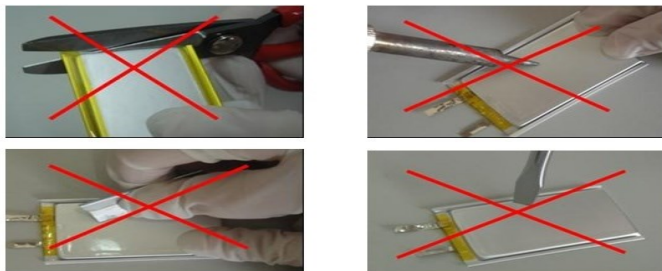


- Don't transport and store the cell together with metal objects such as necklaces, hairpins.

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。



- Do not use or leave the battery at very high temperature conditions (for example, strong direct sunlight or a vehicle in extremely hot conditions). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
禁止在高温下（直热的阳光下或很热的汽车中）使用或放置电池，否则可能会引起电池过热，起火或功能失效，寿命减短。
- Do not use it in a location where is electrostatic and magnetic greatly, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
禁止在强静电和强磁场的地方使用，否则易破坏电池安全保护装置，带来不安全的隐患。
- If the battery leaks, and the electrolyte get into the eyes. Do not wipe eyes, instead, rinse the eyes with clean running water, and immediately seek medical attention. Otherwise, eyes injury can result.
如果电池发生泄漏，电解液进入眼睛，请不要揉擦，应用清水冲洗眼睛，并立即送医治疗，否则会伤

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害眼睛。

- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charge and stop using it.
如果电池发出异味，发热，变色，变形或使用，贮存，充电过程中出现任何异常现象，立即将电池从装置或充电器中移离并停用。
- In case the battery terminals are dirt, clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection with the instrument.
如果电池弄脏，使用前应用干布抹净，否则可能会导致接触不良功能失效。
- Be aware discharged batteries may cause fire; tape the terminals to insulate them.
废弃之电池应用绝缘纸包住电极，以防起火，爆炸。

N/A