

深圳市乾瑞通科技有限公司

SHENZHEN QIANRUITONG TECHNOLOGY Co., LTD

Specification Approval Sheet(Cell) 产品规格确认书（电芯）

Model: WOB503035P

型号: WOB503035P

Date: 2018-5-17

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编制	审核	批准	客户确认

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AMENDMENT RECORDS

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1.Scope

This document describes the Product Specification of the Lithium-Polymer (LIP) rechargeable battery cell supplied by WOB Power Electronic Technology Corporation Limited).

适用范围本规格说明书描述了沃宝锂能可充电聚合物锂离子电池芯的产品性能指标

2.Model: WOB503035

型号: WOB503035

3.Specification

产品规格

NO.	Items	Specifications
1	Charge voltage 充电电压	4.2V
2	Nominal voltage 标称电压	3.7V
3	Nominal capacity 标称容量	500mAh @ 0.2C Discharge (放电)最小值
4	Charge current 充电电流	Standard Charging: 0.2C 标准充电: 0.2C Rapid charge: 1.0C 快速充电: 1.0C
5	Standard Charging method 标准充电方法	0.2C CC (constant current) charge to 4.2V, then CV (constant voltage 4.2V) charge till charge current decline to $\leq 0.02C$ 0.2C CC (恒流) 充电至 4.2V, 再 CV (恒压 4.2V) 充电直至充电电流 $\leq 0.01C$
6	Charging time 充电时间	Standard Charging: 6.0 hours (Ref.) 标准充电: 6.0 小时 (参考值) Rapid charge: 2.5 hours (Ref.) 快速充电: 2.5 小时 (参考值)
7	Max. charge current 最大充电电流	1.0C
8	Max. discharge current 最大放电电流	1.0C
9	Discharge cut-off voltage 放电截止电压	2.75V
10	Operating temperature 工作温度	Charging: 0°C~45°C 充电: 0°C~45°C Discharging: -10°C~60°C 放电: -10°C~60°C
11	Storage temperature 储存温度	-10°C ~ 45°C
12	Cell Dimension 电芯尺寸	Length 长度: 35.8mm Max Width 宽度: 30.5mm Max Thickness 厚度: 5.0mm Max

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4. Battery Cell Performance Criteria

电芯性能检查及测试

4.1 Electrical characteristics 充放电性能

NO.	Items	Test Method and Condition	Criteria
1	Standard Charge 标准充电	Charging the cell initially with constant current at 0.2C and then with constant voltage at 4.2V till charge current declines to 0.01C 先用 0.2C 恒流充电至 4.2V，再恒压 4.2V 充电直至充电电流 $\leq 0.01C$	
2	Rated Capacity 初始容量	The capacity means the discharge capacity of the cell, which is measured with discharge current of 0.2C with 3.0V cut-off voltage after standard charge. 该容量是指标准充电后，0.2C 放电至 3.0V 截止电压所放出的容量。	$\geq 500\text{mAh}$
3	Cycle Life 循环寿命	Test condition: Charge: 0.5C to 4.2V Discharge: 0.5C to 3.0V 80% or more of 1 st cycle capacity at 0.5C discharge of Operation 测试条件: 充电: 0.5C 充电到 4.2V 放电: 0.5C 放电到 3.0V 当放电容量降至初始容量的 80% 时，所完成的循环次数定义为该电芯的循环寿命	≥ 300
4	Self-discharge 自放电	After the standard charging, storied the cells under the condition as No.4.4 for 30 days, then measured the capacity with 0.2C till 3.0V 标准充电后，在 No.4.4 条件下贮存 30 天，再以 0.2C 放电至 3.0V 所放出的容量。	Residual capacity $> 85\%$ 剩余容量 $> 85\%$
5	Initial impedance 初始内阻	Internal resistance measured at AC 1KHz after 50% charge 半充状态下，测量其 AC 1KHz 下的交流阻抗	$\leq 80\text{m}\Omega$
6	Cell Voltage 电芯电压	As of shipment. 出货状态	$\geq 3.80\text{V}$
7	Temperature Characteristics 温度特性	1. According to item 4.1.1, at $20 \pm 5^\circ\text{C}$. 2. Capacity comparison at each temperature, measured with constant discharge current 0.2C with 3.0V cut-off. Percentage as an index of the capacity compared with 100% at $20 \pm 5^\circ\text{C}$. 1. 在 $20 \pm 5^\circ\text{C}$ 条件下，用 4.1.1 方法将电芯充电。 2. 在不同温度条件下，用 0.2C 的电流恒流放电至截止电压 3.0V。以 $20 \pm 5^\circ\text{C}$ 时放电容量为基准计算百分比。	-10°C : $\geq 60\%$ 0°C : $\geq 75\%$ 20°C : $\geq 98\%$ 60°C : $\geq 80\%$
8	Storage Characteristics 储存特性	1. According to item 4.1.1, at $20 \pm 5^\circ\text{C}$. 2. The battery shall be stored at $60 \pm 5^\circ\text{C}$ for 7 days and rested at room temperature for 1 hour then measured with constant discharge current 0.2C with 3.0V cut-off. 1. 在 $20 \pm 5^\circ\text{C}$ 条件下，用 4.1.1 方法将电芯充电。 2. 将电池在温度 $60 \pm 5^\circ\text{C}$ 条件下贮存 7 天，然后在常温下静置 1 小时，用 0.2C 的电流恒流放电至 3.0V 截止电压。	Retained Capacity $\geq 85\%$

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4.2 Mechanical characteristics 机械特性

NO.	Items	Test Method and Condition	Criteria
1	Vibration Test 振动测试	With full charging, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz a 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes. 满电状态下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 1.6 mm, 振动频率为 10Hz~55Hz, 每分钟变化为 1Hz。	No leakage 无泄漏 No fire 不起火 No smoke 不冒烟 Voltage remains 4.0V above 电压保持在 4.0V 以上
2	Drop Test 跌落测试(承接物为 18-20mm 的硬木板)	The cell is to be dropped from a height of meter twice onto wood ground. 将标准充电后的电芯从 1 米高度跌落至木地板 2 次	No fire, no leakage. 无起火、无泄漏

4.3 Safety Characteristics 安全性能

NO.	Items	Test Method and Condition	Criteria
1	Overcharge test 过充电性能	No explosion, no fire 不起火、不爆炸	Discharge : 1C to 3.0V Charge : 3C to 4.6V When the temperature falls 10℃ lower than the peak ,Stop testing 放电: 1C 放电至 3.0V 充电: 3C 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 不起火、不爆炸	After Standard Charging, Short circuit the positive and negative, and the resistance of copper wire is not more than 80mΩ ,When the temperature falls 10℃ lower than the peak ,Stop testing 标准充电后, 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 10℃时, 结束试验。
3	Thermal test 热冲击	No explosion, no fire 不起火、不爆炸	Put cell into an hot box, test condition: Temperature Rate : 5±2℃/min Ending temperature :130℃±2℃ Keep temperature for 30 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 30min, 然后停止测试。

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。

4.4 Visual inspection

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

外观检查

不允许有任何影响电芯性能的外观缺陷，诸如裂纹、裂缝、泄漏等。

4.5 Standard environmental test condition

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:

Temperature: $23 \pm 5^{\circ}\text{C}$

Humidity: $65 \pm 20\% \text{RH}$

标准测试环境

除非特别说明，本标准书中所有测试均在以下环境条件下进行：

温度： $23 \pm 5^{\circ}\text{C}$

湿度： $65 \pm 20\% \text{RH}$

5.Storage and Others

贮存及其它事项

a) Long Time Storage

If the Cell is stored for a long time, the cell's storage should be 3.6~3.9V and the cell is to be stored in a condition as No.4.4.

长期贮存

长期贮存的电池（超过 3 个月）须置于干燥、凉爽处。贮存电压为 3.6~3.9V 且贮存环境要求如 4.4。

b) Others

Any matters that this specification does not cover should be conferred between the customer and manufacturer.

其它事项

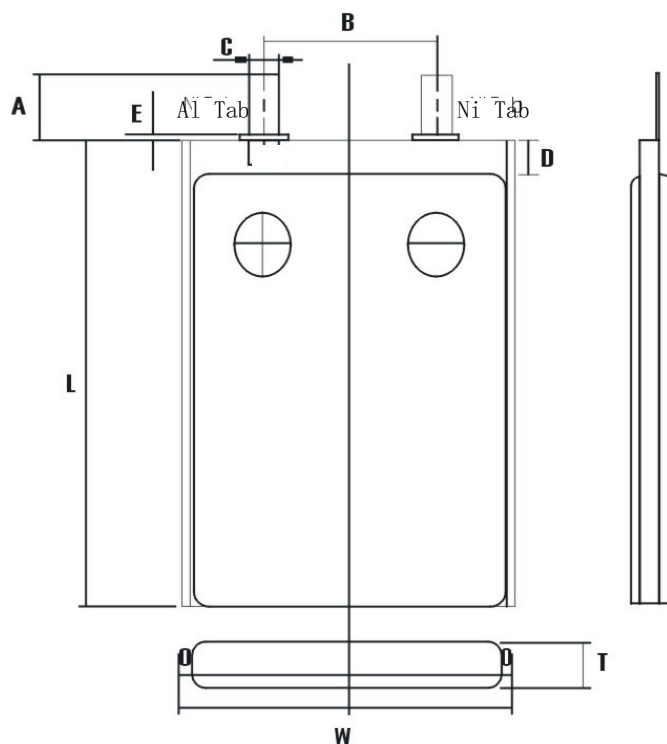
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6. Drawing (all unit in mm, not in scale)

外形尺寸（单位：mm;未按比例）



Items	Description	Dimension and Spec
A	Tab length 极耳长度	7.0mm±2.0mm
B	极耳中心距	17.0mm±2.0mm
C	Tab width 极耳宽度	3.0mm±0.1mm
T	Cell thickness 电芯厚度	5.0mm(Max)
W	Cell width 电芯宽度	30.5mm(Max)
L	Cell length 电芯长度	35.8mm(Max)
D	Sealing length 封装长度	3.2±0.5mm
E	极耳胶外露长度	0.2mm~2mm

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Appendix

附录

Handling Precautions and Guideline For (Lithium-Ion Polymer)Rechargeable Batteries 聚合物锂离子充电电芯操作指示及注意事项

Preface

This document of "Handling Precautions and Guideline LIP Rechargeable Batteries" shall be applied to the battery cells manufactured by WOB.

前言

本文件“聚合物锂离子充电电芯操作指示及注意事项”仅适用沃宝锂能生产的电芯。

Note(1):

The customer is requested to contact WOB in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

声明一:

客户若需要将电芯用于超出文件规定以外的设备，或在文件规定以外的使用条件下使用电芯，应事先联系沃宝锂能，因为需要进行特定的实验测试以核实电芯在该使用条件下的性能及安全性。

Note(2):

WOB will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

声明二:

对于在超出文件规定以外的条件下使用电芯而造成的任何意外事故，沃宝锂能概不负责。

Note(3):

WOB will inform, in a written form, the customer of improvement(s) regarding proper use and handing of the cell, if it is deemed necessary.

声明三:

如有必要，沃宝锂能会以书面形式告之客户有关正确操作使用电芯的改进措施。

1. Charging

充电

1.1 Charging□current:

Charging□current should be less than maximum charge current specified in the Product Specification. Charging with higher current than recommended value may cause damage to cell electrical, mechanical and safety performance and could lead to heat generation or leakage.

充电电流

充电电流不得超过本标准书中规定的最大充电电流。使用高于推荐值电流充电将可能引起电芯的充放电性能、机械性能和安全性能的问题，并可能会导致发热或泄漏。

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1.2 Charging voltage:

Charging shall be done by voltage less than that specified in the Product Specification (4.2V/cell). Charging beyond 4.25V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition.

It is very dangerous that charging with higher voltage than maximum voltage may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.

充电电压

充电电压不得超过本标准书中规定的额定电压（4.2V/电芯）。4.25V 为充电电压最高极限，充电器的设计应满足此条件。

电芯电压高于额定电压值时，将可能引起电芯的充放电性能、机械性能和安全性能的问题，可能会导致发热或泄漏。

1.3 Charging temperature:

The cell shall be charged within 0℃~45℃ range in the Product Specification.

充电温度

电芯必须在 0℃~45℃的环境温度范围内进行充电。

1.4 Prohibition of reverse charging:

Reverse charging is prohibited. The cell shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Simultaneously, the reverse charging may cause damaging to the cell which may lead to degradation of cell performance and damage the cell safety, and could cause heat generation or leakage.

禁止反向充电

正确连接电池的正负极，严禁反向充电。若电池正负极接反，将无法对电芯进行充电。同时，反向充电会降低电芯的充放电性能、安全性，并会导致发热、泄漏。

2. Discharging

放电

2.1 Discharging current

The cell shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharging capacity significantly or cause over-heat.

放电电流

放电电流不得超过本标准书规定的最大放电电流，大电流放电会导致电芯容量剧减并导致过热。

2.2 Discharging temperature

The cell shall be discharged within -10℃~60℃ range specified in the Product Specification.

电芯必须在-10℃~60℃的环境温度范围内进行放电。

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2.3 Over-discharging:

It should be noted that the cell would be at over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the cell shall be charged periodically to maintain between 3.6V and 3.9V.

Over-discharging may causes loss of cell performance, characteristics, or battery functions.

The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voyage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures as follows:

The cell battery pack shall start with a low current (0.01C) for 15-30 minutes, i.e.-charging, before rapid charging starts. The rapid charging shall be started after the (individual) cell voltage has been reached above 2.8V within 15-30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to 2.8V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

过放电

需要注意的是，在电芯长期未使用期间，它可能会用其它自放电特性而处于某种过放电状态。为防止放电的发生，电芯应定期充电，将其电压维持在 3.6V 至 3.9V 之间。

过放电会导致电芯性能、电池功能的丧失。

充电器应有装置来防止电池放电至低于本标准书规定的截止电压。此外，充电器还应有装置以防止重复充电，步骤如下：

电池在快速充电之前，应先以一小电流（0.01C）预充电 15~30 分钟，以使（每个）电芯的电压达到 2.8V 以上，再进行快速充电。可用一计时器来实现该预充电步骤。如果在预充电规定时间内，（个别）电芯的电压仍未升到 2.8V 以上，充电器应能够停止下一步快速充电，并显示该电芯/电池正处于非正常状态。

3. Protection Circuit Module(PCM)

保护电路模块（PCM）

The cell/battery pack shall be with a PCM that can protect cell/battery pack properly.

PCM shall have functions of (1) overcharging prevention, (2) over-discharging prevention, and (3) over current prevention to maintain safety and prevent significant deterioration of cell performance.

The over current can occur by external short circuit

电芯/电池包装应配有 PCM 以正确保护电芯/电池。PCM 应具备以下功能以保证安全并防止损坏电芯性能：1）过充电保护；2）过放电保护；3）过流保护。

3.1 Overcharging prohibition:

Overcharging prevention function shall stop charging if any one of the cells of the battery pack reaches 4.25V.

过充电保护

当电池中任一电芯的电压达 4.25V 时，过充电保护功能应立刻启动并停止充电。

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3.2 Over-discharge prohibition:

Over-discharging prevention function shall work to avoid further drop in cell voltage of 2.3V or less per cell in any cell of the battery pack. It is recommended that the dissipation current of PCM shall be minimized to 0.5uA or less with the over-discharge prevention.

The protection function shall monitor each bank of the battery pack and control the current all the time.

过放电保护

当电池任一电芯的电压降至 2.3V 以下时，过放保护功能应起着保护作用以避免电芯的深度放电。

推荐 PCM 的静态电流小于 0.5 uA，并具有过放保护功能。

该保护功能应实时监控所有电池。

4. Storage

贮存

The cell shall be storied within -10°C~45°C range environmental condition.

If the cell has to be storied for a long time (Over 3 months),the environmental condition should be:

Temperature: $23 \pm 5^{\circ}\text{C}$

Humidity: $65 \pm 20\%\text{RH}$

The voltage for a long time storage shall be 3.6V~3.9V range.

电芯储存温度必须在-10°C~45°C 的范围内。

长期存储电池（超过 3 个月）须置于温度为 $23 \pm 5^{\circ}\text{C}$ 、湿度为 $65 \pm 20\%\text{RH}$ 的环境中。

贮存电压为 3.6V~3.9V

5. Handling of Cells

电芯操作注意事项

Since the battery is packed in soft package, to ensure its better performance, it's very important to carefully handle the battery

由于电芯属于软包装，为保证电芯的性能不受损害，必须小心对电芯进行操作。

5.1 Soft Aluminum foil

The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs, pins and needles.

- Don't strike battery with any sharp edge parts
- Trim your nail or wear glove before taking battery
- Clean worktable to make sure no any sharp particle

铝箔包装材料易被尖锐部件损伤，诸如镍片，尖针。

- 禁止用尖锐部件碰撞电池；
- 取放电芯时，请修短指甲或戴上手套；
- 应清洁工作环境，避免有尖锐物体存在

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5.2 Sealed□edge

Sealing edge is very flimsy.

- Don't bend or fold sealing edge

顶封边

顶封边非常容易受到损害。

- 禁止弯折顶封边

5.3 Folding edge

The folding edge is form in battery process and passed all hermetic test

- Don't open or deform folding edge

折边

折边在电池生产过程中已完成，并通过了密封测试。

- 禁止打开或破坏折边。

5.4 Tabs

The battery tabs are not so stubborn especially for aluminum tab.

- Don't bend tab.

极片

极片的机械强度并非异常坚固，特别是铝片

- 禁止弯折极片。

5.5 Mechanical shock

- Don't Fall, hit, bend battery body

机械撞击

- 禁止坠落、冲击、弯折电芯。

5.6 Short

Short terminals of battery is strictly prohibited, it may damage battery.

短路

任何时候禁止短路电芯，它会导致电芯严重损坏。

6. Notice□Designing Battery Pack

电池外壳设计注意事项

6.1 Pack design

- Battery pack should have sufficient strength and battery should be protected from mechanical shock

外壳设计

- 电池外壳应有足够的机械强度以保证其内部电芯免受机械撞击。

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6.2 PCM design

- The overcharge threshold voltage should not be exceed 4.25V
- The over-discharge threshold voltage should not be lower than 2.3V
- The PCM should have short protection function built inside

保护电路模块设计

- 过充的限制电压应小于 4.25V
- 过放的限制电压应大于 2.30V
- 保护电路模块应具有短路保护功能。

7. Notice for Assembling Battery Pack

电芯与外壳组装注意事项

7.1 Tab connection

- Ultrasonic welding or spot welding is recommended to connect battery with PCM or other parts.
- If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance.
 - a) The solder iron should be temperature controlled and ESD safe
 - b) Soldering temperature should not exceed 350°C
 - c) Soldering time should not be longer than 3s
 - d) Soldering time should not exceed 5 times Keep battery tab cold down before next time soldering.
 - e) Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx.100°C

电芯的连接

建议使用超声波焊接或点焊技术来连接电芯与保护电路模块或其它部分。

如使用手工锡焊，须注意以下事项，以保证电芯的功能：

- a) 烙铁的温度可控能防静电；
- b) 烙铁温度不能超过 350°C
- c) 锡焊时间不能超过 3 秒；
- d) 锡焊次数不能超过 5 次；
- e) 必须在极片冷却后再进行二次焊接；禁止直接加热电芯，高于 100°C会导致电芯损坏。

7.2 Cell fixing

- The battery should be fixed to the battery pack by its large surface area.
- No cell movement in the battery pack should be allowed.

电芯的安装

- 应将电芯的宽面安装在外壳内；
- 电芯不得在壳内活动。

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8. Others

其它事项

8.1 Prevention of short circuit within a battery pack

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection.

8.2 Prohibition of disassembly

严禁拆卸电芯

1) Never disassemble the cells

The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, or other problems.

在任何情况下不得拆卸电芯

拆卸电芯可能会导致内部短路，进而引起鼓气、着火及其它问题。

2) Electrolyte is harmful

LIP battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

电解液有害

聚合物锂电池理论上不存在流动的电解液，但万一有电解液泄漏而接触到皮肤、眼睛或身体其它部位，应立即用清水冲洗电解液并就医。

8.3 Prohibition of dumping of cells into fire

Never incinerate nor dispose the cells in fire. These may cause firing of the cells, which is very dangerous and is prohibited.

严禁将电芯投入火中

在任何情况下，不得燃烧电芯或将电芯投入火中，否则会引起电芯燃烧，这是非常危险的，应绝对禁止。

8.4 Prohibition of cells immersion into liquid such as water

The cells shall never be soaked with liquids such as water, seawater drinks such as soft drinks, juices coffee or others.

严禁将电芯浸入液体，如水

不得将电芯浸泡液体，如淡水、海水、饮料（果汁、咖啡等）。

8.5 Battery cells replacement

The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.

电芯的更换

更换电芯应由电芯供应商或设备供应商完成，用户不得自行更换。

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8.6 Prohibition of use of damaged cells

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of electrolyte, electrolyte leakage and others, the cells shall never be used any more.

The cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing.

禁止使用已损坏的电芯

电芯在运输过程中可能因撞击等原因而损坏，若发现电芯有任何异常特征，如电芯塑料封边损坏，外壳破损，闻到电解液气体，电解液泄漏等，该电芯不得使用。

有电解液泄漏或散发电解液气味的电池应远离火源以避免着火。