立讯检测股份
LCS Testing Lab

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国际互认
检测
TESTING
CNAS L4595

报告编号：LCS210415061ASA100

# Lithium Battery UN38.3 Test Report

# 锂电池UN38.3 测试报告

ST/SG/AC.10/11/Rev.7, Section 38.3

| | | |
|---|---|---|
| Sample name | : | Polymer Lithium ion Battery |
| 物品名称 | : | 聚合物锂离子电池 |
| Model | : | 401727 |
| 型号 | : | |
| Applicant | : | Xplora Technologies AS |
| 申请商 | : | |

深圳立讯检测股份有限公司
Shenzhen LCS Compliance Testing Laboratory Ltd.

# UN38.3 Test Report
## UN38.3测试报告

| | | |
|---|---|---|
| Report No .....: 报告号.....: | LCS210415061ASA100 | |
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| Checked by (+ signature) .....: 审核(签名) .....: | Lilia Zhang/Project Manager 张杨/项目经理 | |
| Approved by (+ signature) .....: 批准(签名) .....: | Hart Qiu/Technical Manager 邱文才/技术总监 | |
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| Date of issue .....: 签发日期.....: | 2021.04.22 | |
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| Applicant's Name .....: 申请商.....: | Xplora Technologies AS | |
| Address .....: 地址.....: | Tangerudvegen 13 2008 Fjerdingby Norway | |
| Manufacturer .....: 制造商.....: | SHENZHEN AIBOD TECHNOLOGY CO LTD<br>深圳市爱邦达科技有限公司 | |
| Address .....: 地址.....: | NO.101 of Workshop 2 in 408, No.1 Langrong Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen City<br>深圳市龙华区大浪街道浪荣路1号明君商务中心408 | |
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| Standard .....: 标准.....: | Section 38.3 of the Seventh Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.7, Section 38.3)<br>联合国《关于危险品货物运输的建议书试验和标准手册》第七修订版第38.3 节 | |
| Test item description .....: 测试项目描述.....: | Polymer Lithium ion Battery<br>聚合物锂离子电池 | |

| | |
|---|---|
| Trade Mark .....:<br>商标.....: | N/A |
| Model/type reference .....:<br>型号/引用型号.....: | 401727 |
| Ratings.....:<br>额定值.....: | 3.7V, 160mAh, 0.592Wh |
| Classification.....:<br>类别.....: | Li-ion Battery<br>锂离子电池 |
| Type of Sample.....:<br>样品形状.....: | Prismatic<br>棱形 |

Details information of the battery and the cell built in the battery, as following:
电池和电芯的详细信息见下表：

| Product<br>产品 | Cell<br>电芯 | Battery<br>电池 |
|---|---|---|
| Model<br>型号 | 401727 | 401727 |
| Nominal voltage<br>标称电压 | 3.7V | 3.7V |
| Rated capacity<br>额定容量 | 160mAh | 160mAh |
| Charge method<br>充电方法 | 32mA CC(constant current) charge to 4.2V, then CV (constant voltage 4.2V) charge till charge current decline to 3.2mA.<br>以32mA恒流充电至4.2V，然后4.2V恒压充电至电流小于等于3.2mA。 | 32mA CC(constant current) charge to 4.2V, then CV (constant voltage 4.2V) charge till charge current decline to 3.2mA.<br>以32mA恒流充电至4.2V，然后4.2V恒压充电至电流小于等于3.2mA。 |
| Standard discharge current<br>标准放电电流 | 32mA | 32mA |
| Maximum continuous charging current<br>最大连续充电电流 | 160mA | 160mA |
| Maximum continuous discharge current<br>最大连续放电电流 | 160mA | 160mA |
| End of discharge voltage<br>放电终止电压 | 3.0V | 3.0V |
| Dimension<br>尺寸 | 25.2*18.1*4.1(mm) | 27.2*18.1*4.1(mm) |
| Weight<br>重量 | 3.1g | 3.5g |

| | |
|---|---|
| Possible test case verdicts:<br>报告中可能用到的结论标识： | |
| Test case does not apply to the test object.....:<br>测试项目不适用于该产品.....: | N/A<br>不适用 |
| Test item does meet the requirement<br>测试项目符合标准的要求.....: | P(ass)<br>合格 |
| Test item does not meet the requirement .....:<br>测试项目不符合标准的要求.....: | F(ail)<br>不合格 |
| Testing:<br>测试： | |
| Date of sample received.....:<br>样品接收日期.....: | 2020.03.05 |
| Date(s) of performance of test.....:<br>测试执行日期.....: | 2020.03.05 ~ 2020.03.16 |

**Test conclusion:**
**检验结论：**

**检验结果: 通过**
**The standard version of this report is upgraded according to LCS190903209ASA. The sample is the same except for the information of the applicant, which is only used for commercial purposes**
**本报告参照LCS190903209ASA进行标准版本升级，除申请商信息外，样品相同，仅用于商业用途**

# Ⅰ、CONCLUSION 结论

| Item<br>项目 | Sample Number<br>样品号 | Standard<br>标准 | Conclusion<br>结论 |
|---|---|---|---|
| Altitude simulation<br>高空模拟 | B01-B10 | Section 38.3 of the Seventh Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.7, Section 38.3)<br>联合国《关于危险品货物运输的建议书试验和标准手册》第七修订版第38.3 节 | PASS<br>合格 |
| Thermal test<br>耐热测试 | | | PASS<br>合格 |
| Vibration<br>振动测试 | | | PASS<br>合格 |
| Shock<br>冲击测试 | | | PASS<br>合格 |
| External short circuit<br>外部短路 | | | PASS<br>合格 |
| Crush/ Impact<br>挤压/撞击 | C01-C10 | | PASS<br>合格 |
| Overcharge<br>过充电测试 | B11-B18 | | PASS<br>合格 |
| Forced discharge<br>强制放电测试 | C11-C30 | | PASS<br>合格 |

Notes备注:

The conditions of the battery of sample No. B01 to B05, B11-B14 are at first cycle, in fully charged state;

样品编号B01-B05, B11-B14的状态为第一个交替充电放电周期完全充电状态的电池;

The conditions of the cells of sample No. C01 to C05 are at first cycle at 50% of the design rated capacity, in fully charged state;

样品编号C01-C05的状态为第一个交替充电放电周期完全充电状态电芯容量设计值的50%的电芯;

The conditions of the cells of sample No. C06 to C10 are after 25 cycles at 50% of the design rated capacity, in fully charged state;

样品编号C06-C10的状态为第二十五个交替充电放电周期完全充电状态电芯容量设计值的50%的电芯;

The conditions of the battery of sample No.B06 to B10, B15 to B18 are after 25 cycles, in fully charged state;

样品编号B06-B10, B15-B18的状态为在二十五个交替充电放电周期结束后完全充电状态的电池;

The conditions of the cells of sample No.C11 to C20 are at first cycle, in fully discharged state;

样品编号C11-C20的状态为第一个交替充电放电周期完全放电状态的电芯;

The conditions of the cells of sample No.C21 to C30 are after 25 cycles ending in fully discharged state.

样品编号C21-C30的状态为在二十五个交替充电放电周期结束后完全放电状态的电芯。

# Ⅱ、MAIN TEST EQUIPMENT 主要测试设备

| Instrument Name 仪器名称 |
|---|
| Battery charge tester 电池充放电测试仪 |
| Battery low press tester 高空模拟试验箱 |
| Rapid temperature rise tester 快速温变试验机 |
| Vibration tester 振动台 |
| Vertical shock Tester 垂直冲击台 |
| Battery external short-circuit tester 电池短路试验机 |
| DC source 直流稳压电源 |
| Battery crush tester 电池挤压试验机 |
| Battery impact tester 电池重物冲击试验机 |
| Scales 天平 |
| Digital multimeter 万用表 |
| Temperature recorder 温度记录仪 |
| Temp.& Humi. Meter 温湿度计 |

# Ⅲ、TEST METHOD AND DATA测试方法和数据

Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells or batteries. Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries.

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

小型电池或电池组必须按顺序进行试验T1至T5。试验T6和T8应使用未试验过的电池或电池组。试验T7可以使用原先在试验T1至T5中使用过的未损坏的电池组进行，以便测试交替充电放电的电池组。

要求电池和电池组无渗漏、无漏气、无解体、无破裂和无起火并且每个电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的90%。有关电压的要求不适用于完全放电状态的电池和电池组。

In order to quantify the mass loss, the following procedure is provided.

$$\text{mass loss} = (M_1 - M_2)/M_1 \times 100\%$$

Where$M_1$is the mass before the test and$M_2$is the mass after the test, when mass loss does not exceed the values in Table below, it shall be considered as “no mass loss”.

质量损失依照下式计算：

$$\text{质量损失} = (M_1 - M_2)/M_1 \times 100\%$$

式中$M_1$是试验前的质量，$M_2$是试验后的质量。如质量损失不超过下表所列数值，即视为“无质量损失”。

| Mass M of cell or battery<br>电池或电池组质量M | Mass lost limited<br>质量损失限值 |
|---|---|
| M＜1g | 0.5% |
| 1g≤M≤75g | 0.2% |
| M＞75g | 0.1% |

**Test T1: Altitude simulation 高度模拟**

**Test procedure 试验程序：**

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5 °C). 试验样品在压力不大于11.6kPa和温度20℃±5°C的环境下存放至少6小时。

**Requirement 要求：**

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

要求样品无漏液、无漏气、无解体、无破裂以及无起火, 且样品试验后开路电压应不低于试验前开路电压的90％。

**Data数据：**

| No. 编号 | Pre-test测试前 | | After test测试后 | | Mass loss 质量损失 (%) | Voltage loss 电压损失 (%) | Verdict# （判定#） |
|---|---|---|---|---|---|---|---|
| | Mass(g) 质量(g) | Voltage(V) 电压(V) | Mass(g) 质量(g) | Voltage(V) 电压(V) | | | |
| B01 | 3.434 | 4.18 | 3.434 | 4.17 | 0.000 | 0.24 | PASS/合格 |
| B02 | 3.490 | 4.17 | 3.490 | 4.17 | 0.000 | 0.00 | PASS/合格 |
| B03 | 3.485 | 4.18 | 3.485 | 4.18 | 0.000 | 0.00 | PASS/合格 |
| B04 | 3.458 | 4.18 | 3.457 | 4.15 | 0.029 | 0.72 | PASS/合格 |
| B05 | 3.447 | 4.17 | 3.447 | 4.17 | 0.000 | 0.00 | PASS/合格 |
| B06 | 3.474 | 4.17 | 3.473 | 4.17 | 0.029 | 0.00 | PASS/合格 |
| B07 | 3.476 | 4.18 | 3.476 | 4.18 | 0.000 | 0.00 | PASS/合格 |
| B08 | 3.464 | 4.17 | 3.463 | 4.16 | 0.029 | 0.24 | PASS/合格 |
| B09 | 3.468 | 4.17 | 3.468 | 4.17 | 0.000 | 0.00 | PASS/合格 |
| B10 | 3.477 | 4.17 | 3.477 | 4.17 | 0.000 | 0.00 | PASS/合格 |

#：No leakage, No venting,No disassembly No rupture and no fire

#：无漏液、无漏气、无解体、无破裂以及无起火现象

**Test T.2: Thermal test 耐热测试**

**Test procedure 测试程序：**

Test cells and batteries are to be stored for at least six hours at a test temperature equal to72 ± 2 °C, followed by storage for at least six hours at a test temperature equal to - 40 ± 2 °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ± 5 °C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

试验样品在试验温度等于72℃±2℃下存放至少6小时，然后在试验温度等于-40℃±2℃下存放至少6小时。两个极端温度之间的最大时间间隔为30分钟。这一过程须重复10次，接着将所有样品在环境温度20℃±5℃下存放24小时。对于大型电池和电池组，暴露于极端试验温度的时间至少应为12小时。

**Requirement 要求**

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

要求样品无漏液、无漏气、无解体、无破裂以及无起火, 且样品试验后开路电压应不低于试验前开路电压的90％。

**Data数据：**

| No.<br>编号 | Pre-test测试前 | | After test测试后 | | Mass loss<br>质量损失<br>(%) | Voltage loss<br>电压损失<br>(%) | Verdict#<br>（判定#） |
|---|---|---|---|---|---|---|---|
| | Mass(g)<br>质量(g) | Voltage(V)<br>电压(V) | Mass(g)<br>质量(g) | Voltage(V)<br>电压(V) | | | |
| B01 | 3.434 | 4.17 | 3.431 | 4.14 | 0.087 | 0.72 | PASS/合格 |
| B02 | 3.490 | 4.17 | 3.489 | 4.15 | 0.029 | 0.48 | PASS/合格 |
| B03 | 3.485 | 4.18 | 3.482 | 4.14 | 0.086 | 0.96 | PASS/合格 |
| B04 | 3.457 | 4.15 | 3.455 | 4.13 | 0.058 | 0.48 | PASS/合格 |
| B05 | 3.447 | 4.17 | 3.444 | 4.14 | 0.087 | 0.72 | PASS/合格 |
| B06 | 3.473 | 4.17 | 3.471 | 4.15 | 0.058 | 0.48 | PASS/合格 |
| B07 | 3.476 | 4.18 | 3.473 | 4.14 | 0.086 | 0.96 | PASS/合格 |
| B08 | 3.463 | 4.16 | 3.461 | 4.14 | 0.058 | 0.48 | PASS/合格 |
| B09 | 3.468 | 4.17 | 3.465 | 4.14 | 0.087 | 0.72 | PASS/合格 |
| B10 | 3.477 | 4.17 | 3.474 | 4.15 | 0.086 | 0.48 | PASS/合格 |

#：No leakage, No venting,No disassembly No rupture and no fire

#：无漏液、无漏气、无解体、无破裂以及无起火现象

**Test T.3: Vibration 振动**

**Test procedure测试程序：**

1. Cells and batteries are firmly secured to the platform of the vibration machine /样品牢固地安装在振动台（的台面）上。

2. The vibration:a sinusoidal waveform with a logarithmic sweep between 7Hz and 200Hz and back to 7Hz traversed in 15 minutes/振动以正弦波形式，对数扫描频率从7Hz增加至200Hz，然后再回到7Hz，一个循环持续15分钟。

3. the logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached, The amplitude is then maintained at 0,8mm (1,6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50Hz), A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz/对数扫频为:从7 赫兹开始保持1gn 的最大加速度直到频率为18 赫兹，然后将振幅保持在0.8 毫米（总偏移1.6 毫米）并增加频率直到最大加速度达到8gn（频率约为50 赫兹），将最大加速度保持在8gn 直到频率增加到200 赫兹。

4. This cycle repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell /每个样品从三个互相垂直的方向上循环12 次，共3 个小时。

**Requirement 要求**

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire during the test and after the test and if the open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure.
要求样品无漏液、无漏气、无解体、无破裂以及无起火, 且样品试验后开路电压应不低于试验前开路电压的90％。

**Data数据：**

| No.<br>编号 | Pre-test测试前 | | After test测试后 | | Mass loss<br>质量损失<br>(%) | Voltage loss<br>电压损失<br>(%) | Verdict#<br>（判定#） |
|---|---|---|---|---|---|---|---|
| | Mass(g)<br>质量(g) | Voltage(V)<br>电压(V) | Mass(g)<br>质量(g) | Voltage(V)<br>电压(V) | | | |
| B01 | 3.431 | 4.14 | 3.431 | 4.14 | 0.000 | 0.00 | PASS/合格 |
| B02 | 3.489 | 4.15 | 3.485 | 4.14 | 0.115 | 0.24 | PASS/合格 |
| B03 | 3.482 | 4.14 | 3.482 | 4.13 | 0.000 | 0.24 | PASS/合格 |
| B04 | 3.455 | 4.13 | 3.454 | 4.13 | 0.029 | 0.00 | PASS/合格 |
| B05 | 3.444 | 4.14 | 3.444 | 4.14 | 0.000 | 0.00 | PASS/合格 |
| B06 | 3.471 | 4.15 | 3.471 | 4.15 | 0.000 | 0.00 | PASS/合格 |
| B07 | 3.473 | 4.14 | 3.473 | 4.13 | 0.000 | 0.24 | PASS/合格 |
| B08 | 3.461 | 4.14 | 3.458 | 4.14 | 0.087 | 0.00 | PASS/合格 |
| B09 | 3.465 | 4.14 | 3.465 | 4.14 | 0.000 | 0.00 | PASS/合格 |
| B10 | 3.474 | 4.15 | 3.474 | 4.15 | 0.000 | 0.00 | PASS/合格 |

#：No leakage, No venting,No disassembly No rupture and no fire

#：无漏液、无漏气、无解体、无破裂以及无起火现象

**Test T4: Shock 冲击**

**Test procedure测试程序:**

1. Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.

2. Each cell or battery shall be subjected to a half sine shock of peak acceleration of 150gn and pulse duration of 6 milliseconds. Alternatively, large cells and large batteries may be subjected to a half-sine shock of peak acceleration of 50gn and pulse duration of 11 milliseconds.

3. Each cell or battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations

以稳固的托架固定住每个样品的安装表面。对每个电样品以峰值为150gn 的半正弦的加速度冲击，脉冲持续6 毫秒，大型电池和大型电池组须经受最大加速度50gn 和脉冲持续时间11 毫秒的半正弦波冲击。每个样品必须经受根据其质量峰值加速度的半正弦震荡。小型电池脉冲持续时间应为6毫秒为和大容量电池脉冲持续时间应为11毫秒。下面的公式供计算相应最小峰值加速度，每个样品须在三个互相垂直的样品安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受18次冲击。

| Battery | Minimum peak acceleration | Pulse duration |
|---|---|---|
| Small batteries | 150 $g_n$ or result of formula<br>Acceleration($g_n$) = $\sqrt{\left(\frac{100850}{\text{mass}^*}\right)}$<br>whichever is smaller | 6 ms |
| Large batteries | 50 $g_n$ or result of formula<br>Acceleration($g_n$) = $\sqrt{\left(\frac{30000}{\text{mass}^*}\right)}$<br>whichever is smaller | 11 ms |

**Requirement 要求:**

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

要求样品无漏液、无漏气、无解体、无破裂以及无起火, 且样品试验后开路电压应不低于试验前开路电压的90％。

**Data数据：**

| No. 编号 | Pre-test测试前 | | After test测试后 | | Mass loss 质量损失 (%) | Voltage loss 电压损失 (%) | Verdict# （判定#） |
|---|---|---|---|---|---|---|---|
| | Mass(g) 质量(g) | Voltage(V) 电压(V) | Mass(g) 质量(g) | Voltage(V) 电压(V) | | | |
| B01 | 3.431 | 4.14 | 3.431 | 4.14 | 0.000 | 0.00 | PASS/合格 |
| B02 | 3.485 | 4.14 | 3.483 | 4.13 | 0.057 | 0.24 | PASS/合格 |
| B03 | 3.482 | 4.13 | 3.482 | 4.13 | 0.000 | 0.00 | PASS/合格 |
| B04 | 3.454 | 4.13 | 3.454 | 4.12 | 0.000 | 0.24 | PASS/合格 |
| B05 | 3.444 | 4.14 | 3.444 | 4.14 | 0.000 | 0.00 | PASS/合格 |
| B06 | 3.471 | 4.15 | 3.469 | 4.14 | 0.058 | 0.24 | PASS/合格 |
| B07 | 3.473 | 4.13 | 3.473 | 4.13 | 0.000 | 0.00 | PASS/合格 |
| B08 | 3.458 | 4.14 | 3.458 | 4.14 | 0.000 | 0.00 | PASS/合格 |
| B09 | 3.465 | 4.14 | 3.463 | 4.14 | 0.058 | 0.00 | PASS/合格 |
| B10 | 3.474 | 4.15 | 3.474 | 4.15 | 0.000 | 0.00 | PASS/合格 |

#：No leakage, No venting,No disassembly No rupture and no fire

#：无漏液、无漏气、无解体、无破裂以及无起火现象

**Test T.5: External short circuit 外短路测试**

**Test method 测试方法:**

The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57 ± 4 °C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57 ± 4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

测试样品的外壳温度达到恒温 57 ± 4 °C 后，再进行外部短路。短路的时间取决于样品的尺寸和设计，并需被评估和记录。如果这个评估无法进行，那么小电芯和小电池短路时间至少 6 小时，大电芯和大电池短路时间至少 12 小时。然后样品在 57±4℃环境下经受一个阻值小于 0.1Ω的外部电路短路。

This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57 ± 4 °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.

样品温度到 57±4℃之后,短路时间需持续 1 小时，大型电池短路温度下降到最大温升的一半或低于 57±4℃。

**Requirement 要求：**

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

要求样品外表面温度不超过170℃, 且试验后6 小时内无解体, 无破裂, 无起火。

**Data数据：**

| No.<br>编号 | Peak temperature(℃)<br>最高温度 | No disassembly, No rupture and no fire<br>无解体、无破裂和无起火 |
|---|---|---|
| B01 | 58.2 | PASS/合格 |
| B02 | 58.1 | PASS/合格 |
| B03 | 58.9 | PASS/合格 |
| B04 | 58.2 | PASS/合格 |
| B05 | 58.3 | PASS/合格 |
| B06 | 58.4 | PASS/合格 |
| B07 | 58.7 | PASS/合格 |
| B08 | 58.2 | PASS/合格 |
| B09 | 58.6 | PASS/合格 |
| B10 | 58.8 | PASS/合格 |

**Test T.6: Impact (applicable to cylindrical cells not less than 18 mm in diameter) / Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18 mm in diameter)撞击(适用于直径不小于18 毫米的圆柱形电池)/挤压(适用于棱柱形、袋装、硬币/ 纽扣电池和直径小于18 毫米的圆柱形电池)**

**Test procedure 测试程序– Impact撞击：**

The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm ± 0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the Centre of the sample. A 9.1 kg ± 0.1 kg mass is to be dropped from a height of 61 ± 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.

The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm ± 0.1mm diameter curved surface lying across the Centre of the test sample. Each sample is to be subjected to only a single impact.

将试验样品放在平坦光滑平面上，将一根长度不少于7cm的316型不锈钢棒横放在试样中心后，将一质量为9.1kg的物体从61±2.5cm 的高度落向样品。待测试电池纵轴与平面平行，与横放在试样中心的直径15.8±0.1 毫米弯曲表面的纵轴垂直。每个样品只经受一次撞击。

**Test Procedure测试程序– Crush挤压：**

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

(a) The applied force reaches 13 KN ± 0.78 KN;

Example: The force shall be applied by a hydraulic ram with a 32 mm diameter piston until a pressure of 17 MPa is reached on the hydraulic ram.

(b) The voltage of the cell drops by at least 100 mV; or

(c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied

perpendicular to the longitudinal axis.

将样品放在两个平面之间挤压，挤压力度逐渐加大，在第一个接触点上的速度大约为1.5厘米/秒。挤压持续进行，直到出现以下三种情况之一：

(a)施加的力量达到13KN± 0.78KN；

(b)样品的电压下降至少100毫伏；

(c)样品变形达原始厚度的50%或以上。

棱柱形或袋装样品应从最宽的一面施压，纽扣/硬币形样品应从其平坦表面施压，圆柱形样品应从与纵轴垂直的方向施压。每个样品只经受一次挤压。

**Requirement 要求:**

Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire during the test and within six hours after this test.

要求样品的最高表面温度不超过170℃，且试验后6个小时之内试验样品无解体和无起火。

**Data数据（Crush 挤压）：**

| No.<br>编号 | Peak temperature(℃)<br>最高温度 | No disassembly, No fire<br>无解体、无起火 |
|---|---|---|
| C01 | 25.9 | PASS/合格 |
| C02 | 25.1 | PASS/合格 |
| C03 | 25.5 | PASS/合格 |
| C04 | 25.4 | PASS/合格 |
| C05 | 25.3 | PASS/合格 |
| C06 | 25.6 | PASS/合格 |
| C07 | 25.7 | PASS/合格 |
| C08 | 25.6 | PASS/合格 |
| C09 | 25.5 | PASS/合格 |
| C10 | 25.2 | PASS/合格 |

**Test T.7: Overcharge 过度充电**

**Test procedure 测试程序：**

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

(a) when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.

(b)when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

以2 倍制造厂推荐的最大持续充电电流对样品充电，本测试最小电压为:

(a)如果厂家推荐的充电电压不超过18V，本测试的最小充电电压应该小于两倍的厂家标定最大充电电压或者是22V

(b)如果厂家推荐的充电电压超过18V，本测试的最小充电电压应该1.2 倍的厂家标定最大充电电压20±5℃的环境温度下，试验持续24 小时。

**Requirement 要求：**

Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

要求样品在试验中和试验后7 天内无解体和无起火。

**Data数据:**

| No.<br>编号 | No disassembly, No fire<br>无解体、无起火 |
|---|---|
| B11 | PASS/合格 |
| B12 | PASS/合格 |
| B13 | PASS/合格 |
| B14 | PASS/合格 |
| B15 | PASS/合格 |
| B16 | PASS/合格 |
| B17 | PASS/合格 |
| B18 | PASS/合格 |

**Test T.8: Forced discharge (for cell)强制放电**

**Test procedure测试程序：**

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).

20±5℃的环境温度下，将样品连接在12V 的直流电源上进行强制放电，此直流电源提供给每个试验样品初始电流为制造商指定的最大放电电流。

对于指定的放电电流则需要和测试样品串联一个匹配的电阻，每一个样品的强制放电时间等于额容量除以初始的测试电流。

**Requirement要求**

Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

要求样品在试验中和试验后7 天内无解体和无起火。

**Data数据：**

| No.<br>编号 | No disassembly and no fire<br>无解体、无起火 |
|---|---|
| C11 | PASS/合格 |
| C12 | PASS/合格 |
| C13 | PASS/合格 |
| C14 | PASS/合格 |
| C15 | PASS/合格 |
| C16 | PASS/合格 |
| C17 | PASS/合格 |
| C18 | PASS/合格 |
| C19 | PASS/合格 |
| C20 | PASS/合格 |
| C21 | PASS/合格 |
| C22 | PASS/合格 |
| C23 | PASS/合格 |
| C24 | PASS/合格 |
| C25 | PASS/合格 |
| C26 | PASS/合格 |
| C27 | PASS/合格 |
| C28 | PASS/合格 |
| C29 | PASS/合格 |
| C30 | PASS/合格 |

# Ⅳ、THE PHOTO OF SAMPLE 样品图片

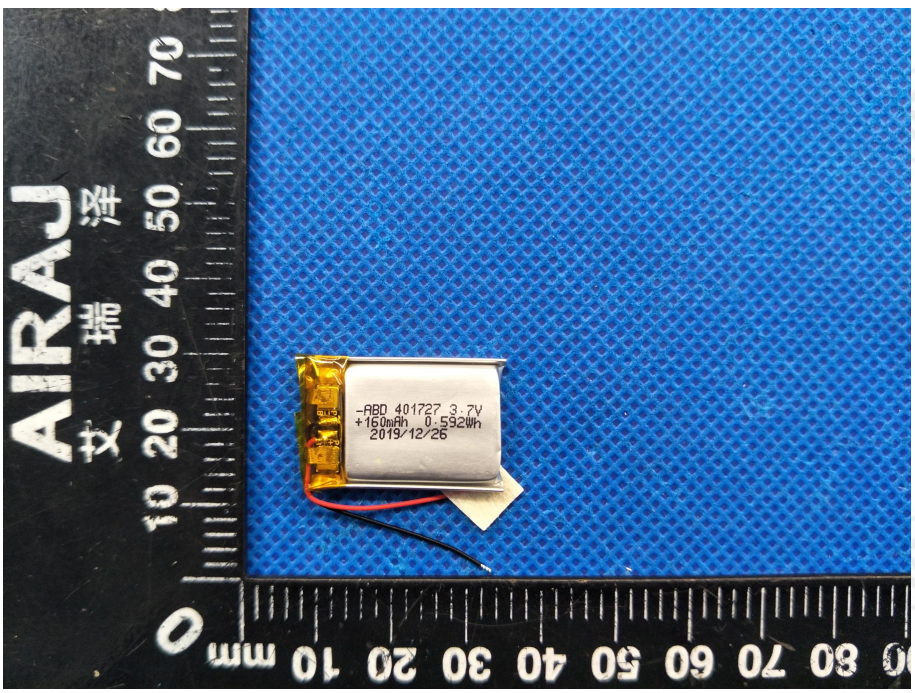



Figure 1

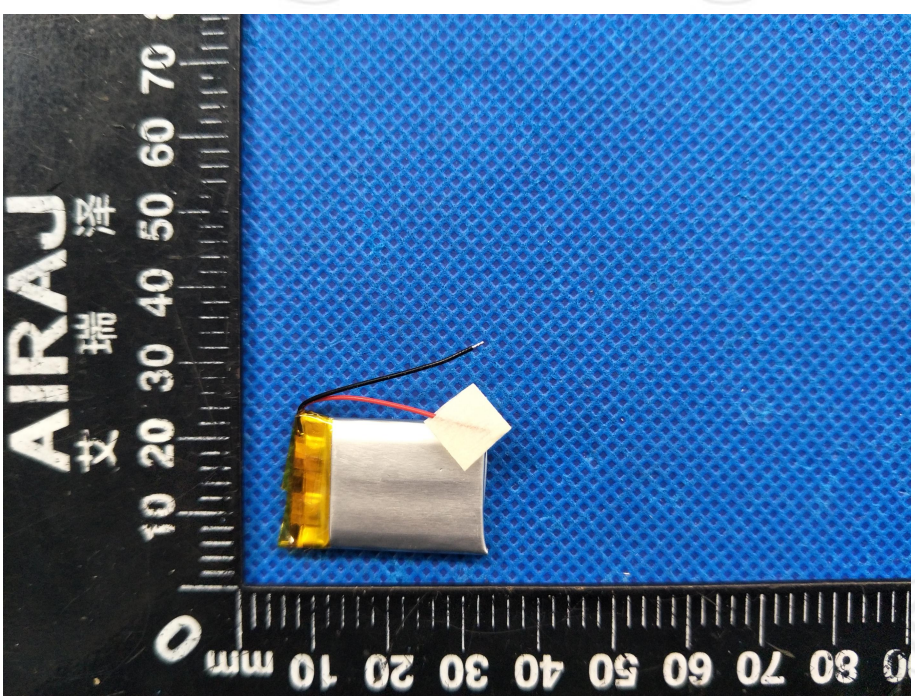



Figure 2

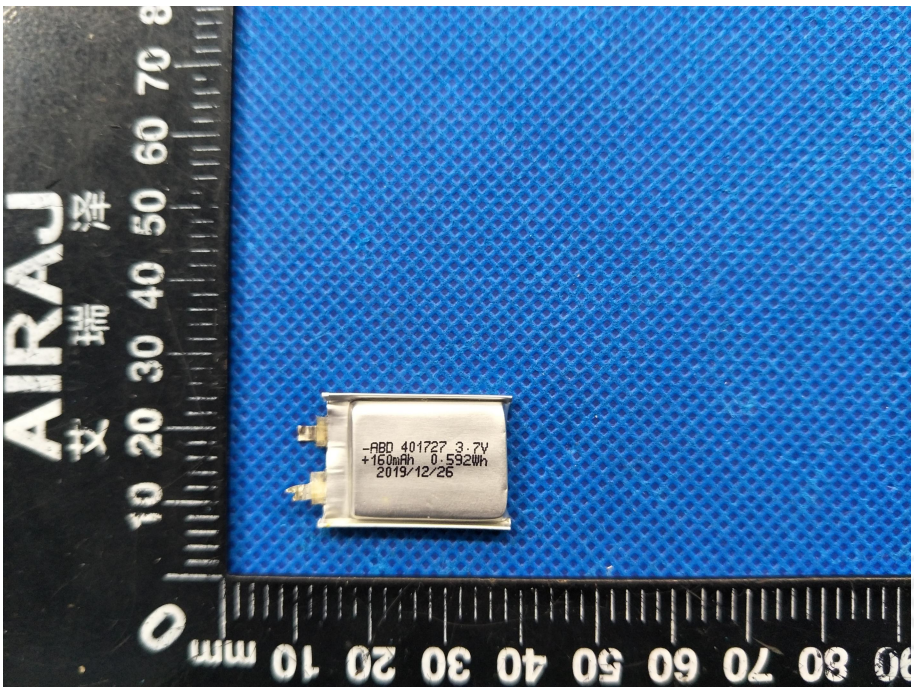



Figure 3

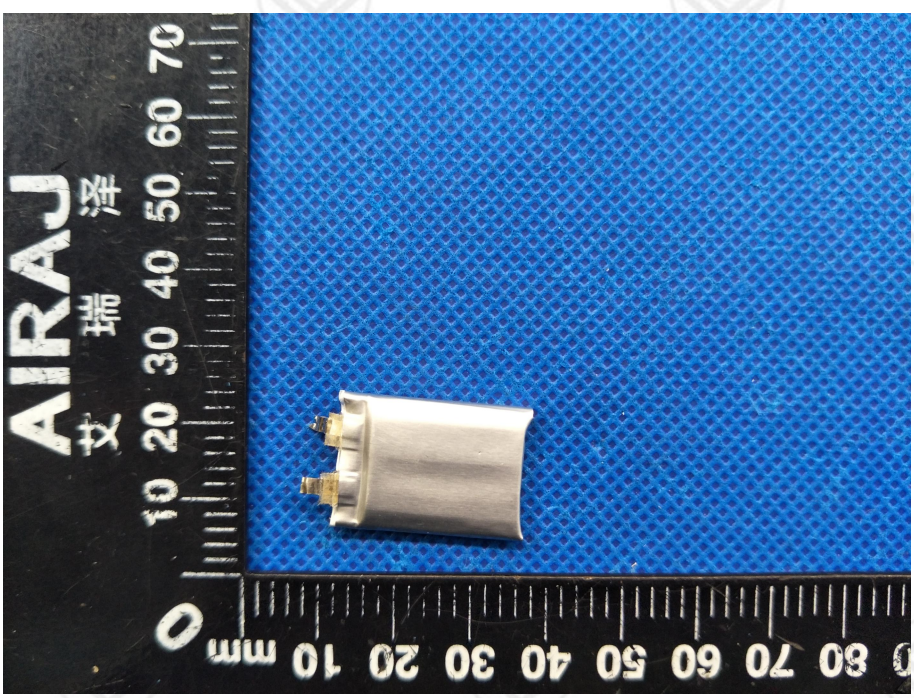



Figure 4

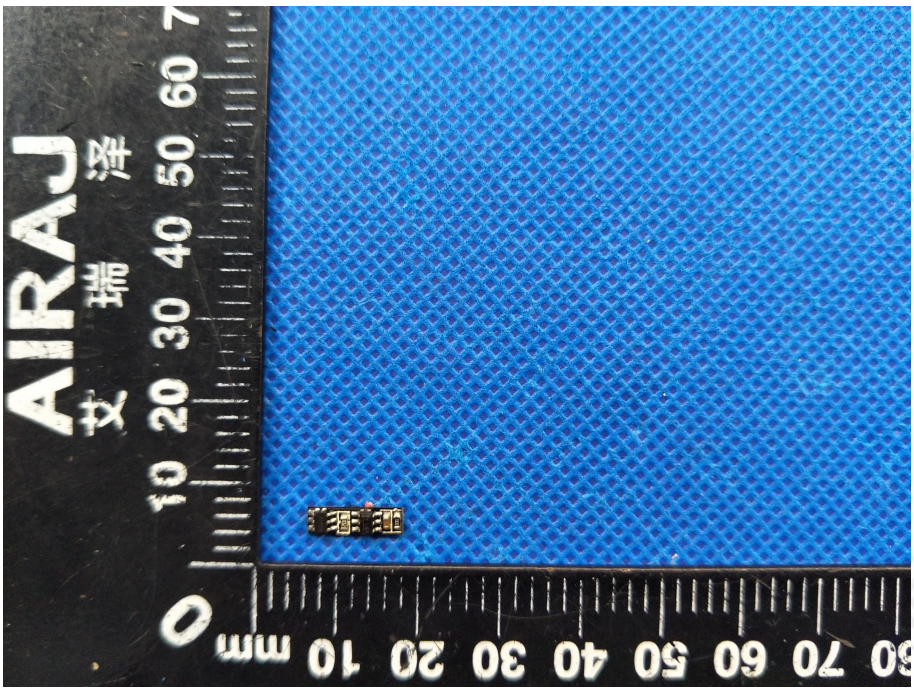



Figure 5

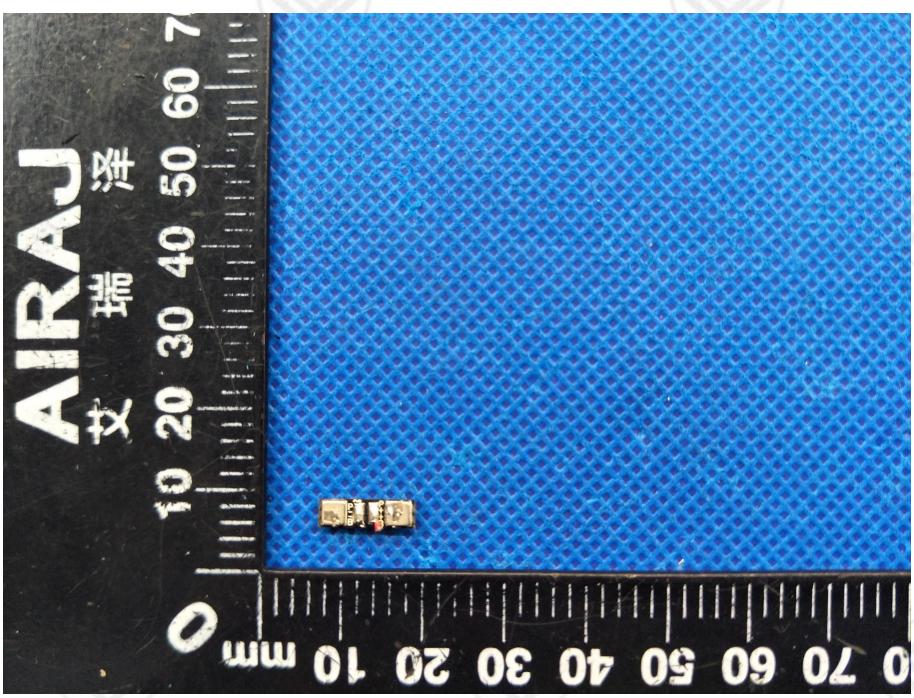



Figure 6

# 注意事项

# Important Notice

1. The test report is invalid without the official stamp of LCS.

本报告书无LCS盖章无效。

2. The test report is invalid without the signatures of Ratifier, Reviewer and Testing engineer.

本报告书无批准人、审核人、及主检人签名无效。

3. Nobody is allowed to partly photocopy this test report without written permission of LCS.

未经LCS书面同意，不得部分地复制本报告书。

4. The report is invalid when anything of following happens – illegal transfer, reproduce, embezzlement, imposture, modification or tampering in any media form.

私自转让、复制、盗用、冒用、涂改、或以任何媒体形式篡改的报告书无效。

5. Product information and customer information provided by the applicant, we are not responsible for its authenticity.

产品信息和客户信息由申请人提供，我们不对其真实性负责。

6. The test report is valid for the tested samples only.

本报告仅对本次测试样品有效。

7. The Chinese contents in this report are only for reference.

本报告中的中文内容仅供参考。

8. Objections to the test report must be submitted to LCS within 15 days.

对报告书若有异议，应于收到报告之日起15天内向本公司提出。

***End of report***