



Microtest
微 测 检 测

UN38.3测试报告

UN38.3 test report

报告编号 Report No.: MTi19091206-1B1-R1

签发日期 Date of issue: Nov. 26, 2019

样品名称: 锂离子电芯
Sample Name : Lithium ion Cell

型号: 75400
Model :

委托方: 惠州市复来能源有限公司
Client : Huizhou Recovery Energy Co., Ltd

委托方地址: 惠州市惠城区马安镇新乐工业城新民二路五楼
Address : Floor 5, Xinmin Road, Xinle Industry Zone, Maan Town, Huicheng District, Huizhou City, Guangdong Province, China

深圳市微测检测有限公司
Shenzhen Microtest Co., Ltd.



本报告是对编号为MTi19091206-1B1检测报告的修改/补充, 原报告作废

This test report is the revision of the test report MTi19091206-1B1, the original report is invalid.

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| ST/SG/AC.10/11/Rev.6 AMENDMENTS TO THE SIXTH REVISED EDITION OF THE RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS, MANUAL OF TEST AND CRITERIA 联合国《关于危险货物运输的建议书，试验和标准手册》 （第六次修订） (Section 38.3: Lithium batteries) （38.3章节：锂电池） | | |
|--|---|--------------------------|
| Sample Name.....: | Lithium ion Cell 样品名称 锂离子电芯 | |
| Trade Mark.....: | N/A 商标 | |
| Sample Model.....: | 75400 样品型号 | |
| Manufacturer.....: | Huizhou Recovery Energy Co., Ltd 制造商 惠州市复来能源有限公司 | |
| Address.....: | Floor 5, Xinmin Road, Xinle Industry Zone, Maan Town, Huicheng District, Huizhou City, Guangdong Province, China 制造商地址 惠州市惠城区马安镇新乐工业城新民二路五楼 | |
| Testing Laboratory.....: | Shenzhen Microtest Co., Ltd. 测试实验室 深圳市微测检测有限公司 No.103&105, 8th Building, Hongwan Industrial Park, Gushu Community, Xixiang , Bao'an District, Shenzhen, Guangdong, China 深圳市宝安区西乡街道固戍社区红湾工业区8号厂房103、105 | |
| Received Date.....: | 2019-09-19 接收日期： | |
| Tested Date.....: | 2019-09-19~2019-10-10 测试日期 | |
| Test conclusion: 试验结论 <p>The Lithium ion Cell submitted by Huizhou Recovery Energy Co., Ltd is tested according to Section 38.3 of the Sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.6 Section 38.3).</p> <p>由惠州市复来能源有限公司送检的锂离子电芯，依据联合国《关于危险品货物运输的建议书》第六修订版第38.3节进行检测。</p> <p>Test result: Pass 试验结果：通过</p> | | |
| Tested by (signature): | Checked by (signature): | Approved by (signature): |
| 测试（签名）：陈亚川 | 审核（签名）：覃开基 | 批准（签名）：薛晓栋 |



I、Sample Information 样品信息

| | | | |
|--------------------------------------|-------|-------------------------------------|--------------------|
| Sample Model 样品型号 | 75400 | Rated capacity 额定容量 | 140mAh/0.518Wh |
| Nominal Voltage 标称电压 | 3.7V | Cell Shape 电芯形状 | Cylindrical 圆柱形 |
| Standard Charge Current 标准充电电流 | 28mA | Maximum Charge Current 最大充电电流 | 140mA |
| Standard Discharge Current 标准放电电流 | 28mA | Maximum Discharge Current 最大放电电流 | 1200mA |
| Limited Charge Voltage 充电限制电压 | 4.2V | Cut-off Voltage 放电截止电压 | 3.0V |

II、Conclusion 总结

| Standard 标准 | Item 项目 | Sample number 样品号 | Verdict 结论 |
|---|--------------------------------|----------------------|---------------|
| ST/SG/AC.10/11/Rev.6 Section 38.3 (UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria) 联合国 《关于危险品货物运输的建议书》 第六修订版 第38.3节 | Altitude simulation 高度模拟 | C1-C10 | PASS 合格 |
| | Thermal test 温度试验 | | PASS 合格 |
| | Vibration 振动 | | PASS 合格 |
| | Shock 机械冲击 | | PASS 合格 |
| | External short circuit 外部短路 | | PASS 合格 |
| | Impact/ Crush 撞击/挤压 | C11-C15 | PASS 合格 |
| | Overcharge 过度充电 | - | N/A 不适用 |
| | Forced discharge 强制放电 | C16-C25, C26-C35 | PASS 合格 |

Possible test case Verdicts:

报告中可能用到的结果标识:

| | |
|---|---------------|
| Test case does not apply to the test object.....: 测试项目不适用于该产品: | N/A 不适用 |
| Test item does meet the requirement.....: 测试项目符合标准的要求 | P(ass) 合格 |
| Test item does not meet the requirement.....: 测试项目不符合标准的要求 | F(ail) 不合格 |



III. Main Test Equipment 主要测试设备

| NO. 编号 | Instrument Name 仪器名称 |
|----------|--|
| MTi-B001 | 低气压试验箱 Low Pressure Chamber |
| MTi-B002 | 高低温冲击试验箱 High-Low Temperature Chamber |
| MTi-B006 | 液压冲击试验台 Hydraulic Shock Tester |
| MTi-B007 | 电磁动态振动测试系统 Electro-dynamic Vibration Test System |
| MTi-B010 | 跌落试验机 Drop Tester |
| MTi-B013 | 烤箱 Oven |
| MTi-B021 | 电子天平 Electronic Balance |
| MTi-B024 | 电池充放电系统 10V/10A Battery Charger System |
| MTi-B025 | 电池充放电系统 10V/10A Battery Charger System |
| MTi-B026 | 电池充放电系统 25V/10A Battery Charger System |
| MTi-B029 | 温度记录仪 Temperature Recorder |
| MTi-B031 | 直流稳压电源 DC Source |
| MTi-B032 | 直流稳压电源 DC Source |
| MTi-B033 | 直流电子负载 DC Electronic load |
| MTi-B044 | 温度记录仪 Temperature Recorder |
| MTi-B049 | 万用表 Multimeter |
| MTi-B052 | 挤压试验机 Crush Tester |
| MTi-B053 | 撞击试验机 Impact Tester |

IV、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 than 90% 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.

必须用相同的电芯或电池按照顺序进行试验1到试验5。试验6和试验8要用没进行过其他试验的电芯或电池。为了测试循环后的电池，试验7可用试验1到试验5后没损坏的电池。

要求电池和电池组无渗漏、无排气、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 blow, 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 电池或电池组质量 | Mass lost limite 质量损失限值 |
|--|-----------------------------------|
| M < 1g | 0.5% |
| 1g ≤ M ≤ 75g | 0.2% |
| M > 75g | 0.1% |

Test T.1: Altitude simulation 高度模拟
(1) Test procedure 试验过程

Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature (20±5)°C.

试验的电芯或电池应在11.6kPa或更少的气压下存放至少6小时，温度控制在(20±5)°C。

(2) 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. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

电芯或电池应满足以下要求：无漏液、无排气、无分解、无破裂以及无着火现象的发生。样品试验后开路电压应不低于试验前开路电压的90%，此要求不适用于完全放电状态的电池和电芯。

Data 数据如下表：

| No. 编号 | Pre-test 测试前 | | After test 测试后 | | Mass loss 质量损失 (%) | Voltage after test/ Voltage pre- test 试验后电压/试验 前电压 (%) | Verdict 结论 |
|-----------|-------------------|----------------------|-------------------|----------------------|--------------------------|--|---------------|
| | Mass 质量 (g) | Voltage 电压 (V) | Mass 质量 (g) | Voltage 电压 (V) | | | |
| C1 | 3.481 | 4.19 | 3.480 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C2 | 3.462 | 4.19 | 3.461 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C3 | 3.467 | 4.19 | 3.466 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C4 | 3.443 | 4.19 | 3.442 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C5 | 3.445 | 4.19 | 3.445 | 4.19 | 0.000 | 100.00 | PASS/合格 |
| C6 | 3.433 | 4.19 | 3.432 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C7 | 3.430 | 4.19 | 3.429 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C8 | 3.499 | 4.19 | 3.498 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C9 | 3.426 | 4.19 | 3.425 | 4.19 | 0.029 | 100.00 | PASS/合格 |
| C10 | 3.423 | 4.19 | 3.423 | 4.19 | 0.000 | 100.00 | PASS/合格 |

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

#: 无漏液、无排气、无分解、无破裂以及无着火现象

No.C1 to C10 batteries are end in fully charged state after first cycle.

编号C1-C10的状态为在第一个交替充电放电周期完全充电状态的电池。



Test T.2: Thermal test 温度试验

(1) Test procedure 试验过程

Test cells and batteries are to be stored for at least six hours at a test temperature equal to $72 \pm 2^\circ\text{C}$, followed by storage for at least six hours at a test temperature equal to $-40 \pm 2^\circ\text{C}$. 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) $^\circ\text{C}$. For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

试验电池和电池组在试验温度等于 $72 \pm 2^\circ\text{C}$ 下存放至少6小时，接着在试验温度等于 $-40 \pm 2^\circ\text{C}$ 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，接着将所有电池在环境温度(20 ± 5) $^\circ\text{C}$ 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。

(2) 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. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

电芯或电池满足以下要求：无漏液、无排气、无分解、无破裂以及无着火现象的发生。样品试验后开路电压应不低于试验前开路电压的90%，此要求不适用于完全放完电状态的电池和电芯。

Data 数据如下表:

| No. 编号 | Pre-test测试前 | | After test测试后 | | Mass loss 质量损失 (%) | Voltage after test/ Voltage pre- test 试验后电压/试验 前电压 (%) | Verdict 结论 |
|-----------|-------------------|----------------------|-------------------|----------------------|--------------------------|--|---------------|
| | Mass 质量 (g) | Voltage 电压 (V) | Mass 质量 (g) | Voltage 电压 (V) | | | |
| C1 | 3.480 | 4.19 | 3.478 | 4.12 | 0.057 | 98.33 | PASS/合格 |
| C2 | 3.461 | 4.19 | 3.458 | 4.12 | 0.087 | 98.33 | PASS/合格 |
| C3 | 3.466 | 4.19 | 3.464 | 4.12 | 0.058 | 98.33 | PASS/合格 |
| C4 | 3.442 | 4.19 | 3.439 | 4.13 | 0.087 | 98.57 | PASS/合格 |
| C5 | 3.445 | 4.19 | 3.442 | 4.12 | 0.087 | 98.33 | PASS/合格 |
| C6 | 3.432 | 4.19 | 3.430 | 4.12 | 0.058 | 98.33 | PASS/合格 |
| C7 | 3.429 | 4.19 | 3.427 | 4.13 | 0.058 | 98.57 | PASS/合格 |
| C8 | 3.498 | 4.19 | 3.495 | 4.12 | 0.086 | 98.33 | PASS/合格 |
| C9 | 3.425 | 4.19 | 3.423 | 4.12 | 0.058 | 98.33 | PASS/合格 |
| C10 | 3.423 | 4.19 | 3.420 | 4.12 | 0.088 | 98.33 | PASS/合格 |

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

#: 无漏液、无排气、无分解、无破裂以及无着火现象

No.C1 to C10 batteries are end in fully charged state after first cycle.

编号C1-C10的状态为在第一个交替充电放电周期完全充电状态的电池。

Test T.3: Vibration 振动

(1) Test procedure 试验过程

1 Cells and batteries are firmly secured to the platform of the vibration machine /电芯和电池牢固地安装在振动台的台面上。

2 The vibration :a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes/振动以正弦波形式，以7Hz增加至200Hz，然后在减少回到7Hz为一个循环，一个循环持续15分钟的对数前移传送。

3 the logarithmic frequency sweep is as follows: from 7Hz a peak acceleration of 1gn is maintained until 18 Hz is reached, The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of 8gn occurs (approximately 50Hz), A peak acceleration of 8 gn is then maintained until the frequency is increased to 200Hz/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 /以振动的其中一个方向必须是垂直样品极性，对每个电芯从三个互相垂直的方向上循环12次，共3个小时。

(2) 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. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

电芯或电池满足以下要求：无漏液、无排气、无分解、无破裂以及无着火现象的发生。样品试验后开路电压应不低于试验前开路电压的90%，此要求不适用于完全放完电状态的电池和电芯。

Data 数据如下表:

| No. 编号 | Pre-test测试前 | | After test测试后 | | Mass loss 质量损失 (%) | Voltage after test/ Voltage pre- test 试验后电压/试验 前电压 (%) | Verdict 结论 |
|-----------|-------------------|----------------------|-------------------|----------------------|--------------------------|--|---------------|
| | Mass 质量 (g) | Voltage 电压 (V) | Mass 质量 (g) | Voltage 电压 (V) | | | |
| C1 | 3.478 | 4.12 | 3.477 | 4.12 | 0.029 | 100.00 | PASS/合格 |
| C2 | 3.458 | 4.12 | 3.457 | 4.12 | 0.029 | 100.00 | PASS/合格 |
| C3 | 3.464 | 4.12 | 3.463 | 4.12 | 0.029 | 100.00 | PASS/合格 |
| C4 | 3.439 | 4.13 | 3.437 | 4.13 | 0.058 | 100.00 | PASS/合格 |
| C5 | 3.442 | 4.12 | 3.441 | 4.12 | 0.029 | 100.00 | PASS/合格 |
| C6 | 3.430 | 4.12 | 3.430 | 4.12 | 0.000 | 100.00 | PASS/合格 |
| C7 | 3.427 | 4.13 | 3.426 | 4.12 | 0.029 | 99.76 | PASS/合格 |
| C8 | 3.495 | 4.12 | 3.493 | 4.12 | 0.057 | 100.00 | PASS/合格 |
| C9 | 3.423 | 4.12 | 3.421 | 4.12 | 0.058 | 100.00 | PASS/合格 |
| C10 | 3.420 | 4.12 | 3.419 | 4.12 | 0.029 | 100.00 | PASS/合格 |

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

#: 无漏液、无排气、无分解、无破裂以及无着火现象

No.C1 to C10 batteries are end in fully charged state after first cycle.

编号C1-C10的状态为在第一个交替充电放电周期完全充电状态的电池。



Test T.4: Shock 机械冲击

(1) Test procedure 试验过程

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. Each cell or battery shall be subjected to a halfsine shock of peak acceleration of 150gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of 50gn and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

以稳固的支架固定住每个电芯和电池样品的全部试验表面。对每个电芯或电池以峰值为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。每个电池或电池组须在三个互相垂直的电池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 $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller | 6 ms |
| Large batteries | 50 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller | 11 ms |

* Mass is expressed in kilograms.

(2) 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. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

电芯或电池应满足以下要求：无漏液、无排气、无分解、无破裂以及无着火现象的发生。样品试验后开路电压应不低于试验前开路电压的90%，此要求不适用于完全放完电的电池和电芯。



Data 数据如下表:

| No. 编号 | Pre-test测试前 | | After test测试后 | | Mass loss 质量损失 (%) | Voltage after test/ Voltage pre- test 试验后电压/试验 前电压 (%) | Verdict 结论 |
|-----------|-------------------|----------------------|-------------------|----------------------|--------------------------|--|---------------|
| | Mass 质量 (g) | Voltage 电压 (V) | Mass 质量 (g) | Voltage 电压 (V) | | | |
| C1 | 3.477 | 4.12 | 3.476 | 4.12 | 0.029 | 100.00 | PASS/合格 |
| C2 | 3.457 | 4.12 | 3.456 | 4.11 | 0.029 | 99.76 | PASS/合格 |
| C3 | 3.463 | 4.12 | 3.463 | 4.12 | 0.000 | 100.00 | PASS/合格 |
| C4 | 3.437 | 4.13 | 3.436 | 4.12 | 0.029 | 99.76 | PASS/合格 |
| C5 | 3.441 | 4.12 | 3.440 | 4.12 | 0.029 | 100.00 | PASS/合格 |
| C6 | 3.430 | 4.12 | 3.430 | 4.12 | 0.000 | 100.00 | PASS/合格 |
| C7 | 3.426 | 4.12 | 3.425 | 4.11 | 0.029 | 99.76 | PASS/合格 |
| C8 | 3.493 | 4.12 | 3.493 | 4.11 | 0.000 | 99.76 | PASS/合格 |
| C9 | 3.421 | 4.12 | 3.421 | 4.12 | 0.000 | 100.00 | PASS/合格 |
| C10 | 3.419 | 4.12 | 3.419 | 4.12 | 0.000 | 100.00 | PASS/合格 |

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

#: 无漏液、无排气、无分解、无破裂以及无着火现象

No.C1 to C10 batteries are end in fully charged state after first cycle.

编号C1-C10的状态为在第一个交替充电放电周期完全充电状态的电池。



Test T.5: External short circuit 外部短路

(1) Test procedure 试验过程

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches $57\pm 4^{\circ}\text{C}$ and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at $57\pm 4^{\circ}\text{C}$. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to $57\pm 4^{\circ}\text{C}$.

试验电芯和电池在 $57\pm 4^{\circ}\text{C}$ 的环境温度下, 经受外部电阻小于0.1欧姆的短路试验, 短路时间持续到至少电芯或电池表面温度回复到 $57\pm 4^{\circ}\text{C}$ 后1小时才结束。

(2) 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.

电芯或电池应满足以下要求: 在试验过程中以及试验后6个小时内不起火、不解体、无破裂、表面温度不超过 170°C 。

Data 数据如下表:

| No. 编号 | Peak temperature($^{\circ}\text{C}$) 表面最高温度 | Verdict 结论 |
|-----------|--|---------------|
| C1 | 88.7 | PASS/合格 |
| C2 | 91.6 | PASS/合格 |
| C3 | 89.4 | PASS/合格 |
| C4 | 95.6 | PASS/合格 |
| C5 | 86.4 | PASS/合格 |
| C6 | 97.2 | PASS/合格 |
| C7 | 85.2 | PASS/合格 |
| C8 | 92.6 | PASS/合格 |
| C9 | 91.8 | PASS/合格 |
| C10 | 93.6 | PASS/合格 |

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

#: 无漏液、无排气、无分解、无破裂以及无着火现象

No.C1 to C10 batteries are end in fully charged state after first cycle.

编号C1-C10的状态为在第一个交替充电放电周期完全充电状态的电池。



Test T.6: Impact /Crush (applicable to cylindrical cells not less than 18.0mm in diameter) / Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0mm in diameter) 撞击(适用于直径不小于18.0mm的圆柱形电池)/挤压(适用于棱形、袋状、硬币/纽扣电芯和直径小于18.0mm的圆柱形电芯)

(1) Test procedure 试验过程– Impact 撞击

The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm \pm 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 9.1kg \pm 0.1kg mass is to be dropped from a height of 61 \pm 2.5cm 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 \pm 0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

将试验电池或元件电池放在平坦光滑平面上，将一根直径为15.8 mm \pm 0.1mm的长度取6cm或比电池更长的尺寸中的最长那个的不锈钢棒横放在样品中心，将一质量为9.1kg \pm 0.1kg的重锤从61 \pm 2.5cm的高度跌落到钢棒与试验样品交叉点上。重锤跌落由一个没有摩擦的、对重锤阻力最小的垂直轨道或管道加以控制用以引导落锤沿水平支撑表面呈90度落下。待试电池纵轴与平面平行，与横放在试样中心的直径15.8 mm \pm 0.1mm弯曲表面的纵轴垂直。每个样品只经受一次撞击。

(2) Test procedure 试验过程– 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 1.5cm/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 \pm 0.78kN;
- (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.

Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

将电芯或电芯组件放在两个平面之间进行挤压。挤压力度逐渐加大，在第一个接触点上的速度大约为1.5cm/s。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13 kN \pm 0.78kN;
- (b) 电芯的电压下降至少100mV; 或
- (c) 电芯变形达原始厚度的50%或以上。

棱形或袋状电芯应从最宽的一面施压，纽扣/硬币形电池应从其平坦表面施压，圆柱形电芯应从与纵轴垂直的方向施压。每块电芯或组成电芯只进行一次挤压测试，试验样品应持续观察6h。本试验应用从未进行过其它试验的电芯或电芯组件。



(3) 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.

电芯与电芯组件应满足以下要求：试验过程中及试验结束后6个小时之内不起火、不解体、表面温度不超过170°C。

Data 数据如下表：

| No. 编号 | Peak temperature(°C) 表面最高温度 | Verdict 结论 |
|-----------|--------------------------------|---------------|
| C11 | 32.4 | PASS/合格 |
| C12 | 30.2 | PASS/合格 |
| C13 | 31.8 | PASS/合格 |
| C14 | 30.9 | PASS/合格 |
| C15 | 32.0 | PASS/合格 |

No.C21 to C25 cells are end in fully discharged state after first cycle at 50%.

编号C21-C25的状态为在第一个交替充电放电周期完全放电50%状态的电芯。

Test T.8: Forced discharge 强制放电**(1) Test procedure 试验过程**

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).

在环境温度下，将电池连接在12V的直流电源上进行强制放电，此直流电源提供给电芯的初始电流为制造商规定的最大放电电流。对于指定的放电电流则需要和测试电芯串联一个匹配的电阻负载，每一个电芯的强制放电时间等于额定容量除以试验初始的放电电流。

(2) 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.

一次或可充电电芯应满足以下要求：试验样品在试验后7天内不解体、不起火。

Data 数据如下表:

| No.编号 | Verdict 结论 |
|-------|---------------|
| 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 |
| C31 | PASS/合格 |
| C32 | PASS/合格 |
| C33 | PASS/合格 |
| C34 | PASS/合格 |
| C35 | PASS/合格 |

No.C16 to C25 cells are end in fully discharged state after first cycle.

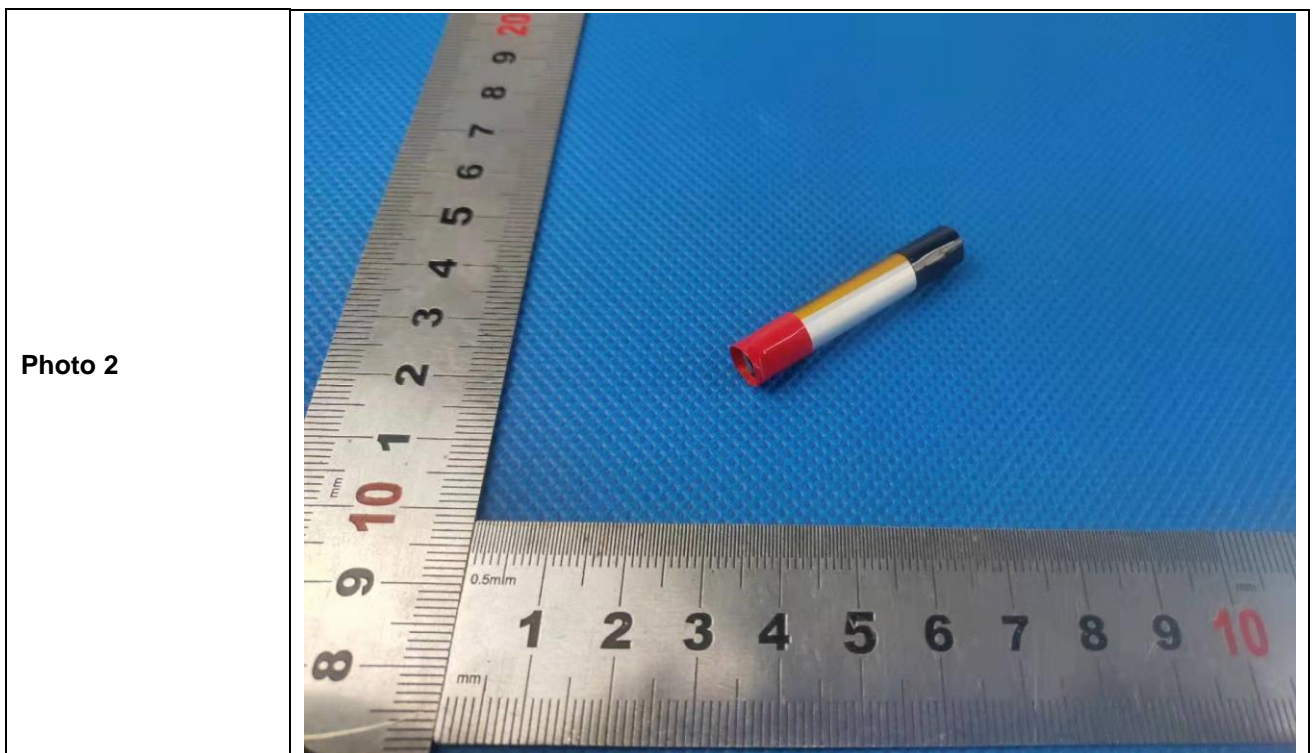
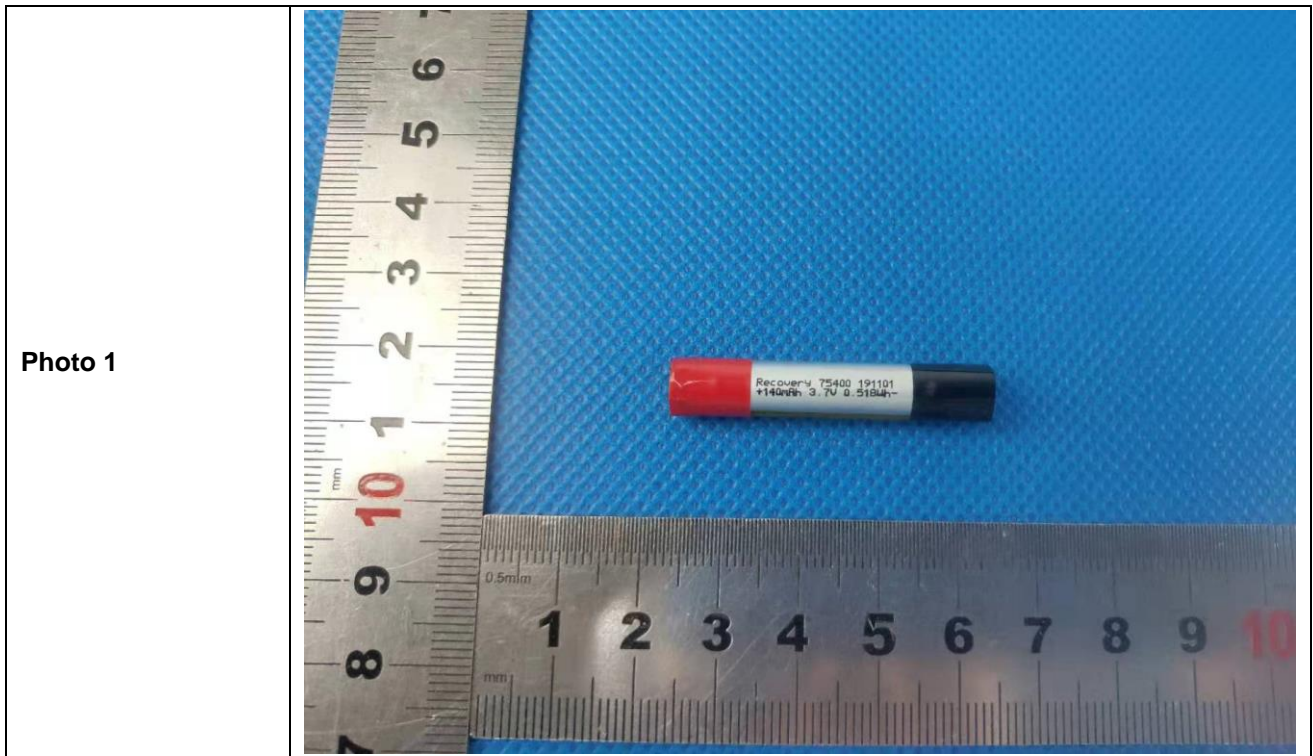
编号C16-C25的状态为在第一个交替充电放电周期完全放电状态的电芯;

No.C26 to C35 cells are end in fully discharged state after 50 cycles.

编号C26-C35的状态为在五十个交替充电放电周期结束后完全放电状态的电芯。



Photos of The Sample 样品图片



Important Notice

注 意 事 项

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

本报告无检测单位“检验专用章”无效。

2. The test report is invalid without the signature of ratifier, reviewer.

本报告无批准人、审核人签名无效。

3. Nobody is allowed to photocopy or partly photocopy this report without written permission of the lab.

未经本实验室书面同意，不得部分地复制本报告。

4. The test report is invalid if illegal transfer, altered or tampering in any media form.

本报告私自转让、涂改或以任何媒体形式篡改无效。

5. If any test method is deviation from the designated test method, must be commented in the test data sheet.

如果报告中部分项目相对于测试依据有偏离的，需在当前测试项目中予以说明。

6. Objections to the test report must be submitted to lab within 15 days.

对检测报告若有异议，应于收到报告之日起十五天内向检测单位提出。

7. The test report is valid for the tested sample only.

本报告仅对测试样品有效。

***** End of Report 报告结束*****