



中国认可  
国际互认  
检测  
TESTING  
CNAS L4065



Report No.:/报告编号:  
GZLS20190325U01

## 检测报告

### TEST REPORT

NAME OF SAMPLE: Rechargeable Li-ion Polymer Battery

产品名称: 二次锂电池组/锂离子电池

CLIENT: TWS Technology (Guangzhou) Limited

委托单位: 广州明美新能源有限公司

CLASSIFICATION OF TEST: Commission test

检测类别: 委托检测

广州邦禾检测技术有限公司

Guangzhou MCM Certification and Testing Co., Ltd



Applicant information 申请资料	
Name of samples 样品名称	Rechargeable Li-ion Polymer Battery 二次锂电池组/锂离子电池
Samples' type 样品类型	Lithium Ion Battery 锂离子电池
Type/ Model 型号规格	BT-000393 3.8V 6350mAh 24.13Wh
Brand 商标	—
Appearance 样品外观	This battery is constructed with 2 lithium-ion cells (2P1S) and has overcharge, over-discharge, over current and short-circuits proof circuit, covered with hard black plastic film, approx 112g/pcs. 电池由 2 个电芯组成(2 并 1 串) 和含有过充、过放、过流和短路的保护线路, 覆盖黑色塑膜, 质量约为 112g。
Client 委托单位	TWS Technology (Guangzhou) Limited 广州明美新能源有限公司 No.39 Nanyunsan Road, Science Park, Hi-Tech Industrial Development Zone, Guangzhou 510663, P.R.China 广州市高新技术产业开发区科学城南云三路 39 号 Tel: +86-20-29114223 Fax: +86-20-22215113 E-mail: li.jun@tws.com
Manufacturer 制造商	TWS Technology (Guangzhou) Limited 广州明美新能源有限公司 No.39 Nanyunsan Road, Science Park, Hi-Tech Industrial Development Zone, Guangzhou 510663, P.R.China 广州市高新技术产业开发区科学城南云三路 39 号
Factory 生产厂	TWS Technology (Guangzhou) Limited 广州明美新能源有限公司 No.39 Nanyunsan Road, Science Park, Hi-Tech Industrial Development Zone, Guangzhou 510663, P.R.China 广州市高新技术产业开发区科学城南云三路 39 号
Testing standard 测试标准	UN Manual of Tests and Criteria ST/SG/AC.10/11/Rev.6, amend1, section 38.3. 联合国《关于危险货物运输的建议书试验和标准手册》ST/SG/AC.10/11/Rev.6, amend1, section 38.3.
Sample quantity 样品数量	46pcs: 16B+30C
Receiving date 接收日期	2019.03.25
Test date 测试日期	2019.03.25 – 2019.04.22

Test Conclusion 测试结论				
No. 序号	Name of test 测试项目名称	Test result 测试结果	Conclusion 本项结论	Remarks 备注
1	38.3.4.1 Altitude simulation 38.3.4.1 高度模拟	See Appendix 1 见附表 1	Passed 合格	/
2	38.3.4.2 Thermal test 38.3.4.2 温度试验	See Appendix 2 见附表 2	Passed 合格	/
3	38.3.4.3 Vibration 38.3.4.3 振动	See Appendix 3 见附表 3	Passed 合格	/
4	38.3.4.4 Shock 38.3.4.4 冲击	See Appendix 4 见附表 4	Passed 合格	/
5	38.3.4.5 External Short-circuit 38.3.4.5 外部短路	See Appendix 5 见附表 5	Passed 合格	/
6	38.3.4.6 Impact 38.3.4.6 撞击	/	/	N/A 不适用
	38.3.4.6 Crush 38.3.4.6 挤压	See Appendix 6 见附表 6	Passed 合格	/
7	38.3.4.7 Overcharge 38.3.4.7 过度充电	See Appendix 7 见附表 7	Passed 合格	/
8	38.3.4.8 Forced discharge 38.3.4.8 强制放电	See Appendix 8 见附表 8	Passed 合格	/

**Conclusion/结论:**

The Rechargeable Li-ion Polymer Batteries submitted by TWS Technology (Guangzhou) Limited have passed the test items of UNITED NATIONS' Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria ST/SG/AC.10/11/Rev.6, amend1, section 38.3.

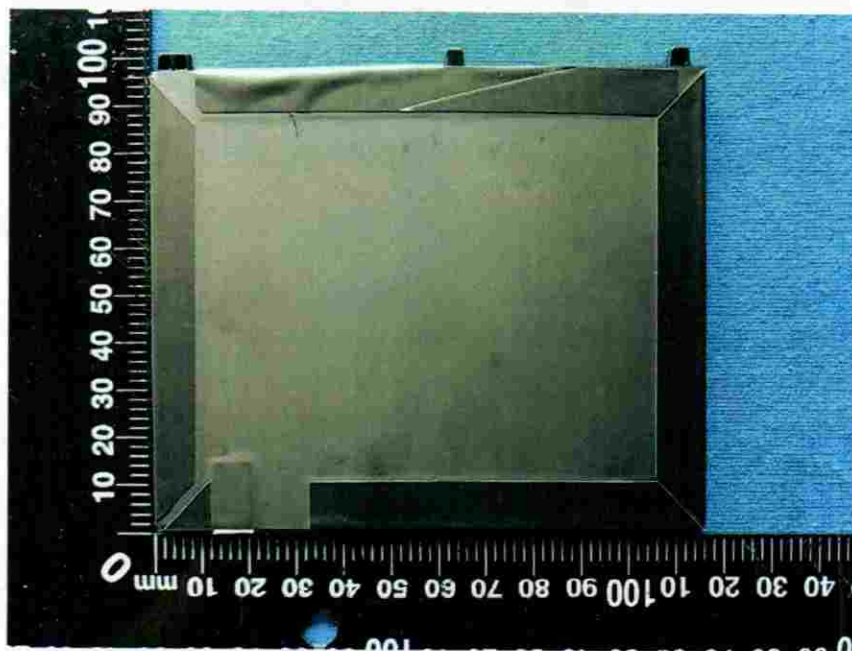
由广州明美新能源有限公司送检的二次锂电池组/锂离子电池符合联合国《关于危险品货物运输的建议书 试验和标准手册》ST/SG/AC.10/11/Rev.6, amend1, section 38.3 的要求。

Tested by Ye Runlong (Test Engineer)	 Seal/检测专用章: Date of issue/日期: April 24, 2019
测试: Ye Runlong (测试工程师)	
Reviewed by Huang Yining (Audit Engineer)	
审核: Huang Yining (审核工程师)	
Approved by Xu Hongbin (Approval Engineer)	
批准: Xu Hongbin (批准工程师)	



## Photos of samples and markings 样品及标识照片

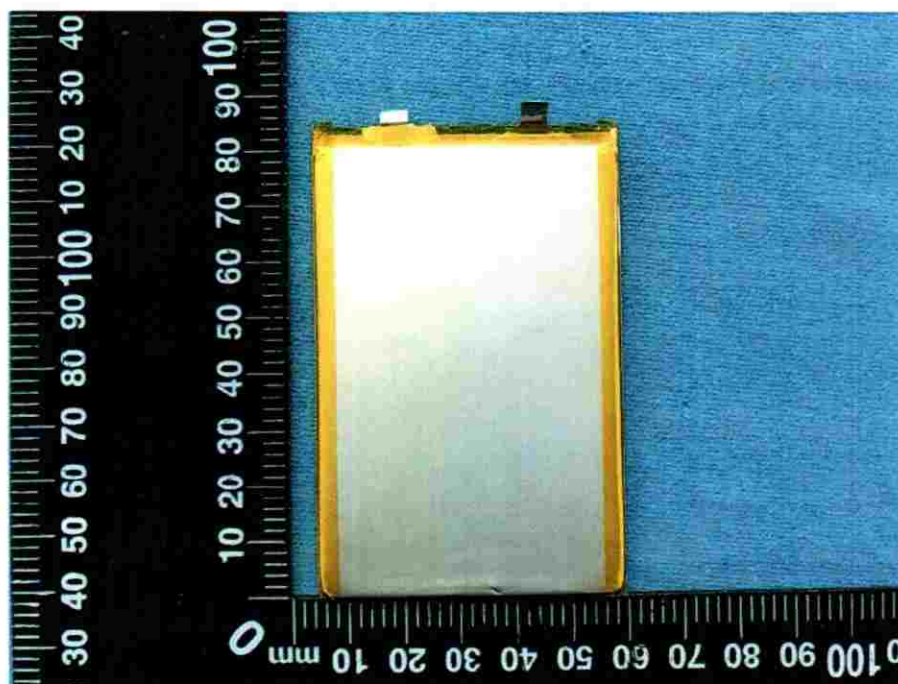
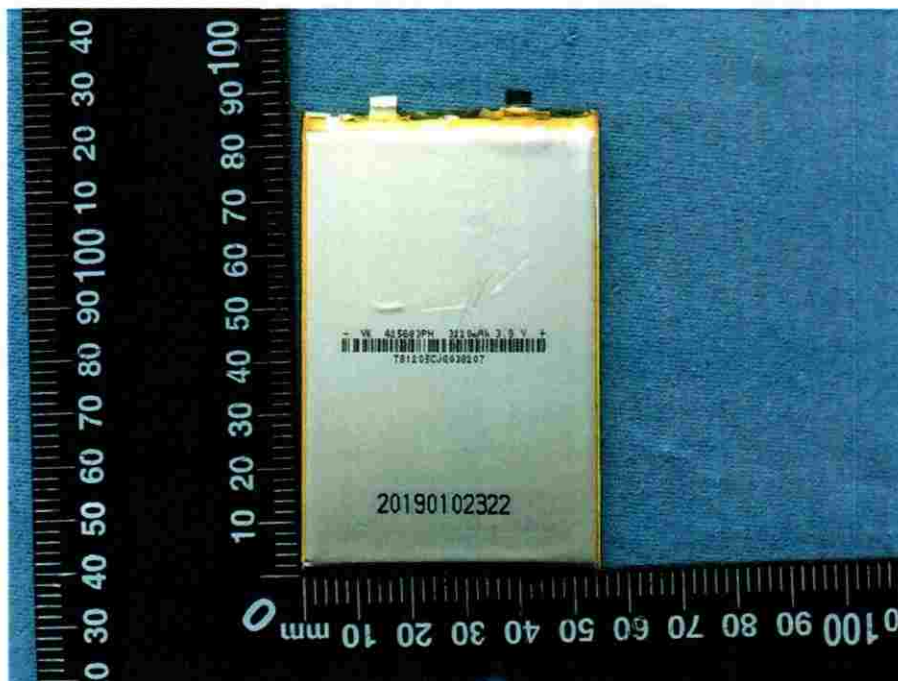
**Battery (BT-000393 3.8V 6350mAh 24.13Wh)**



**Model(型号): BT-000393**  
**Rechargeable (3.8V) Li-ion Polymer Battery**  
**FOR USE WITH ET5X SERIES ONLY**  
**充电限制电压: 4.35V 1ICP5/56/84-2**  
**二次锂离子电池/锂离子电池**  
**MIN.(额/额定容量): 6350mAh 24.13Wh**

# Photos of samples and markings 样品及标识照片

Component cell (425683PH 3.8V 3220mAh 12.236Wh)



## Appendix 1

## 附表 1

Items 项目	38.3.4.1 Altitude simulation 38.3.4.1 高度模拟						
1.1	<b>Test procedure</b> 测试步骤						
	Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hour at ambient temperature (20±5℃). 试验电池芯和电池在环境温度(20±5℃)下, 储存在小于等于 11.6kPa 的压力下至少 6 小时。						
1.2	<b>Sample status</b> 样品状态						
	B1#-B4#: at first cycle in fully charged states B1#-B4#:在第一个循环完全充电状态						
	B5#-B8#: after 25 cycles ending in fully charged states B5#-B8#:在第 25 个循环完全充电状态						
1.3	<b>Result</b> 测试结果						
Sample No. 编号	Before 测试前		After 测试后		Mass loss 质量损失 (%)	Residual OCV 剩余电压 (%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量 (g)	Voltage 开路电压 (V)			
B1#	111.907	4.33	111.906	4.32	0.001	99.77	O
B2#	112.012	4.32	112.012	4.32	0.000	100.00	O
B3#	112.475	4.33	112.474	4.32	0.001	99.77	O
B4#	112.017	4.32	112.017	4.32	0.000	100.00	O
B5#	111.887	4.33	111.886	4.32	0.001	99.77	O
B6#	111.681	4.33	111.680	4.33	0.001	100.00	O
B7#	111.908	4.33	111.908	4.33	0.000	100.00	O
B8#	111.783	4.32	111.783	4.32	0.000	100.00	O
Note: 备注	L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, O-No leakage, no venting, no disassembly, no rupture, no fire. L- 泄漏; V- 排气; D- 解体; R- 破裂; F- 起火; O- 无泄漏、无排气、无解体、无破裂、无起火。						



## Appendix 2

## 附表 2

Items 项目	38.3.4.2 Thermal test 38.3.4.2 温度试验						
1.1	<b>Test procedure</b> 测试步骤						
	<p>Test cells and batteries are to be stored for at least six hours at a test temperature equal to <math>72 \pm 2^\circ\text{C}</math>, followed by storage for at least six hours at a test temperature equal to <math>-40 \pm 2^\circ\text{C}</math>. 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 (<math>20 \pm 5^\circ\text{C}</math>).</p> <p>将电芯和电池在温度为 <math>72 \pm 2^\circ\text{C}</math> 的条件下贮存不少于 6 个小时, 然后, 在温度 <math>-40 \pm 2^\circ\text{C}</math> 条件下贮存不少于 6 个小时, 两个温度间的间隔最长为 30min, 重复操作上述步骤直到 10 次, 然后, 将其在环境温度为 <math>20 \pm 5^\circ\text{C}</math> 的条件下放置 24 个小时。</p>						
1.2	<b>Sample status</b> 样品状态						
	<p>B1#-B4#: at first cycle in fully charged states B1#-B4#: 在第一个循环完全充电状态</p> <p>B5#-B8#: after 25 cycles ending in fully charged states B5#-B8#: 在第 25 个循环完全充电状态</p>						
1.3	<b>Result</b> 测试结果						
Sample No. 编号	Before 测试前		After 测试后		Mass loss 质量损失 (%)	Residual OCV 剩余电压 (%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量 (g)	Voltage 开路电压 (V)			
B1#	111.906	4.32	111.894	4.26	0.011	98.61	O
B2#	112.012	4.32	112.001	4.25	0.010	98.38	O
B3#	112.474	4.32	112.463	4.25	0.010	98.38	O
B4#	112.017	4.32	112.006	4.25	0.010	98.38	O
B5#	111.886	4.32	111.876	4.25	0.009	98.38	O
B6#	111.680	4.33	111.668	4.26	0.011	98.38	O
B7#	111.908	4.33	111.894	4.25	0.013	98.15	O
B8#	111.783	4.32	111.772	4.25	0.010	98.38	O
Note: 备注	<p>L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, O-No leakage, no venting, no disassembly, no rupture, no fire.</p> <p>L- 泄漏; V- 排气; D- 解体; R- 破裂; F- 起火; O- 无泄漏、无排气、无解体、无破裂、无起火。</p>						

## Appendix 3

## 附表 3

Items 项目	38.3.4.3 Vibration 38.3.4.3 振动						
1.1	<b>Test procedure</b> 测试步骤						
	Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration, The vibration shall be a sinusoidal wave form with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes, This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell. 将电芯和电池牢固地安装在振动台的台面上，然后开始振动。振动以正弦波形式，以 7Hz 增加至 200Hz，然后再减少回到 7Hz 为一个循环，一个循环持续 15 分钟的对数扫频。每个电芯和电池从三个互相垂直的方向上循环 12 次，3 个小时。						
1.2	<b>Sample status</b> 样品状态						
	B1#-B4#: at first cycle in fully charged states B1#-B4#:在第一个循环完全充电状态						
	B5#-B8#: after 25 cycles ending in fully charged states B5#-B8#:在第 25 个循环完全充电状态						
1.3	<b>Result</b> 测试结果						
Sample No. 编号	Before 测试前		After 测试后		Mass loss 质量损失 (%)	Residual OCV 剩余电压 (%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量 (g)	Voltage 开路电压 (V)			
B1#	111.894	4.26	111.892	4.25	0.002	99.77	O
B2#	112.001	4.25	112.000	4.23	0.001	99.53	O
B3#	112.463	4.25	112.460	4.24	0.003	99.76	O
B4#	112.006	4.25	112.006	4.23	0.000	99.53	O
B5#	111.876	4.25	111.875	4.23	0.001	99.53	O
B6#	111.668	4.26	111.666	4.25	0.002	99.77	O
B7#	111.894	4.25	111.891	4.24	0.003	99.76	O
B8#	111.772	4.25	111.771	4.24	0.001	99.76	O
Note: 备注	L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, O-No leakage, no venting, no disassembly, no rupture, no fire. L- 泄漏; V- 排气; D- 解体; R- 破裂; F- 起火; O- 无泄漏、无排气、无解体、无破裂、无起火。						



## Appendix 4

## 附表 4

Items 项目	38.3.4.4 Shock 38.3.4.4 冲击						
1.1	<b>Test procedure</b> 测试步骤						
	<p>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 battery. Each 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. Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.</p> <p>被测电芯和电池用坚硬的支架紧固在试验装置上, 支架支撑着每个试验电池的所有安装面。每个电池所经受的半正弦冲击加速度取决于电池的质量。小型电池脉冲持续时间 6 毫秒, 大电池脉冲持续时间 11 毫秒。每个电池芯或电池应在三个垂直面的正向各承受 3 次冲击, 负向再各承受 3 次冲击, 共 18 次。</p>						
1.2	<b>Sample status</b> 样品状态						
	B1#-B4#: at first cycle in fully charged states B1#-B4#: 在第一个循环完全充电状态						
	B5#-B8#: after 25 cycles ending in fully charged states B5#-B8#: 在第 25 个循环完全充电状态						
1.3	<b>Result</b> 测试结果						
Sample No. 编号	Before 测试前		After 测试后		Mass loss 质量损失 (%)	Residual OCV 剩余电压 (%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量 (g)	Voltage 开路电压 (V)			
B1#	111.892	4.25	111.892	4.24	0.000	99.76	O
B2#	112.000	4.23	112.000	4.23	0.000	100.00	O
B3#	112.460	4.24	112.460	4.23	0.000	99.76	O
B4#	112.006	4.23	112.006	4.23	0.000	100.00	O
B5#	111.875	4.23	111.875	4.23	0.000	100.00	O
B6#	111.666	4.25	111.666	4.24	0.000	99.76	O
B7#	111.891	4.24	111.891	4.24	0.000	100.00	O
B8#	111.771	4.24	111.771	4.24	0.000	100.00	O
Note: 备注	L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, O-No leakage, no venting, no disassembly, no rupture, no fire. L- 泄漏; V- 排气; D- 解体; R- 破裂; F- 起火; O- 无泄漏、无排气、无解体、无破裂、无起火。						

## Appendix 5

## 附表 5

Items 项目	38.3.1.5 External Short-circuit 38.3.1.5 外部短路		
1.1	<b>Test procedure</b> 测试步骤		
	<p>The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of <math>57\pm4^{\circ}\text{C}</math>, 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 <math>57\pm4^{\circ}\text{C}</math> shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.</p> <p>This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to <math>57\pm4^{\circ}\text{C}</math>, 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. The short circuit and cooling down phases shall be conducted at least at ambient temperature.</p> <p>待试验电芯或电池的温度须处于稳定状态,使其外壳温度达到 <math>57\pm4^{\circ}\text{C}</math>, 测量外表温度, 这段时间取决于电芯或电池的尺寸和设计,应该评估和记录。如果这个评估是不可行的,曝光时间应小电芯和小电池至少 6 小时、大电芯和大型电池至少 12 个小时。接着使电芯或电池在 <math>57\pm4^{\circ}\text{C}</math> 下经受总外阻小于 0.1 欧姆的短路状况。</p> <p>这一短路状况应在电芯或电池外壳温度恢复至 <math>57\pm4^{\circ}\text{C}</math> 后至少持续 1 小时。或对于大型电池,已经下降至最高温升的一半,测试期间的观察,仍低于这个值。短路和降温阶段应当至少到环境温度。</p>		
1.2	<b>Sample status</b> 样品状态		
	B1#-B4#: at first cycle in fully charged states B1#-B4#:在第一个循环完全充电状态		
	B5#-B8#: after 25 cycles ending in fully charged states B5#-B8#:在第 25 个循环完全充电状态		
1.3	<b>Result</b> 测试结果		
Sample No. 编号	Max. External Temperature 样品表面最高温度 ( $^{\circ}\text{C}$ )	Test result 测试结果	Note 备注
B1#	58.2	O	/
B2#	57.9	O	/
B3#	57.8	O	/
B4#	57.8	O	/
B5#	57.6	O	/
B6#	58.0	O	/
B7#	58.3	O	/
B8#	58.5	O	/
Note: 备注	D-Disassembly, R-Rupture, F-Fire, O- no disassembly, no rupture, no fire. D- 解体; R- 破裂; F- 起火; O-无解体、无破裂、无起火。		

## Appendix 6

## 附表 6

Items 项目	38.3.4.6 Crush 38.3.4.6 挤压		
1.1	<b>Test procedure</b> 测试步骤		
	<p>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.</p> <p>(a) The applied force reaches 13kN±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.</p> <p>Once the maximum pressure has been obtained, the voltage drops by 100mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.</p> <p>电池芯或组成电池芯在两个平面间挤压。挤压在第一个接触点以约 1.5cm/s 的速度慢慢进行，直到下面三个选项之一达到为止：</p> <p>(a) 作用力达到 13kN±0.78kN；            (b) 电池芯电压降至少达到 100mV；            (c) 电池芯厚度和最初比较变形至少 50%。</p> <p>一旦达到最大压力，电压降超过 100 mV 或者电池芯变形超过 50%，压力应该解除。</p>		
1.2	<b>Sample status</b> 样品状态		
	C1#-C5#: at first cycle at 50% of the design rated capacity C1#-C5#:在第一个循环 50%的额定容量		
	C6#-C10#: after 25 cycles ending at 50% of the design rated capacity C6#-C10#:在第 25 个循环 50%的额定容量		
1.3	<b>Result</b> 测试结果		
Sample No. 编号	Max. External Temperature 样品表面最高温度 (°C)	Test result 测试结果	Note 备注
C1#	23.5	O	/
C2#	23.6	O	/
C3#	24.0	O	/
C4#	24.4	O	/
C5#	24.5	O	/
C6#	23.6	O	/
C7#	24.1	O	/
C8#	24.2	O	/
C9#	23.9	O	/
C10#	24.0	O	/
Note: 备注	<b>D-Disassembly, F-Fire, O-no disassembly, no fire.</b> D- 解体；F- 起火；O- 无解体、无起火。		



## Appendix 7

## 附表 7

Items 项目	38.3.4.7 Overcharge 38.3.4.7 过度充电		
1.1	<b>Test procedure</b> 测试步骤		
	The manufacturer's recommended maximum charge voltage is 4.35V; The manufacturer's recommended maximum continuous charge current is 3.0A. 厂家推荐最大充电电压为 4.35V, 厂家推荐最大充电电流为 3.0A。		
	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; 制造商建议的充电电压不大于 18 伏时, 实验的最小电压应是电池组最大充电电压的两倍或 22 伏两者中的较小者。	The test voltage is 8.70V; The test current is 6.0A. 测试电压: 8.70V; 测试电流: 6.0A	
	When the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times maximum charge voltage. 制造商建议的充电电压大于 18 伏时, 实验的最小电压应是最大充电电压的 1.2 倍。	Not Apply 不适用	
1.2	<b>Sample status</b> 样品状态		
	B9#-B12#: at first cycle in fully charged states B9#-B12#:在第一个循环完全充电状态		
	B13#-B16#: after 25 cycles ending in fully charged states B13#-B16#:在第 25 个循环完全充电状态		
1.3	<b>Result</b> 测试结果		
Sample No. 编号	Voltage before test 测试前电压 (V)	Test result 测试结果	Note 备注
B9#	4.33	O	/
B10#	4.33	O	/
B11#	4.33	O	/
B12#	4.33	O	/
B13#	4.33	O	/
B14#	4.33	O	/
B15#	4.33	O	/
B16#	4.33	O	/
Note: 备注	D-Disassembly, F-Fire, O-no disassembly, no fire. D- 解体; F- 起火; O- 无解体、无起火。		

## Appendix 8

## 附表 8

Items 项目	38.3.4.8 Forced discharge 38.3.4.8 强制放电				
1.1	<b>Test procedure</b> 测试步骤				
	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 $20 \pm 5^{\circ}\text{C}$ 的环境温度下, 将单个电芯连接在 12V 的直流电源上进行强制放电, 此直流电源提供每个电芯初始电流为制造厂指定的最大放电电流, 放电时间为额定容量除以初始电流。				
1.2	<b>Sample status</b> 样品状态				
	C11#-C20#: at first cycle in fully discharged states C11#-C20#: 在第一个循环完全放电状态				
	C21#-C30#: after 25 cycles ending in fully discharged states; C21#-C30#: 在第 25 个循环完全放电状态				
1.3	<b>Result</b> 测试结果				
Sample No. 编号	Voltage before test 测试前电压 (V)	Test result 测试结果	Sample No. 编号	Voltage before test 测试前电压 (V)	Test result 测试结果
C11#	3.421	O	C21#	3.388	O
C12#	3.395	O	C22#	3.411	O
C13#	3.388	O	C23#	3.389	O
C14#	3.419	O	C24#	3.395	O
C15#	3.411	O	C25#	3.400	O
C16#	3.375	O	C26#	3.411	O
C17#	3.389	O	C27#	3.423	O
C18#	3.409	O	C28#	3.422	O
C19#	3.418	O	C29#	3.417	O
C20#	3.411	O	C30#	3.411	O
Note: 备注	D-Disassembly, F-Fire, O-no disassembly, no fire. D- 解体; F- 起火; O- 无解体、无起火。				

**注意事项**  
**Important**

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4. 本报告涂改无效。

The test report is invalid if altered.

5. 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。

Objections to the test report must be submitted to Guangzhou MCM Certification and Testing Co., Ltd. Within 15 days.

6. 本报告仅对来样负责。

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-End the test report-