

检 验 报 告

Test Report

产 品 名 称 : 可充电式锂离子电池组/锂离子电池组/锂电池
/二次锂电池组/锂离子电池/锂电池 (可充电)
/锂离子蓄电池/二次锂离子电池组

Sample Name: Rechargeable Li-ion Battery Pack

型 号 : AP20CBL

Model/ Type : AP20CBL

委 托 单 位 : 珠海冠宇电池股份有限公司

Client : Zhuhai CosMX Battery Co., Ltd.

珠海冠宇电池股份有限公司测试中心
Test Center of ZhuHai CosMX Battery Co., Ltd.



Applicant information

申请资料

Name of samples: 样品名称:	Rechargeable Li-ion Battery Pack 可充电式锂离子电池组/锂离子电池组/锂电池/二次锂电池组/锂离子电池/锂电池 (可充电)/锂离子蓄电池/二次锂离子电池组
Type/Model: 型号规格:	AP20CBL 11.55V 4457mAh/4590mAh(Rated/Typ) 51.47Wh/53.00Wh(Rated/Typ)
Lithium content: 锂含量:	—
Commission by: 委托单位:	Zhuhai CosMX Battery Co., Ltd. 珠海冠宇电池股份有限公司
Commissioner address: 委托单位地址:	(South Zone, First Floor, A Work Factory) No.209, Zhufeng Road, Jing'an Town, Doumen District, Zhuhai City, Guangdong, P.R.China 广东省珠海市斗门区井岸镇珠峰大道 209 号 (A 厂房首层南区)
Manufacturer: 制造商:	Zhuhai CosMX Battery Co., Ltd. 珠海冠宇电池股份有限公司
Manufacturer Address: 制造商地址:	(South Zone, First Floor, A Work Factory) No.209, Zhufeng Road, Jing'an Town, Doumen District, Zhuhai City, Guangdong, P.R.China 广东省珠海市斗门区井岸镇珠峰大道 209 号 (A 厂房首层南区)
Manufacturer contact information: 制造商联系方式:	Tel: 0756-6321999 Email: tc@cosmx.com URL: http:// www.coslight-zh.com
Factory: 生产厂:	Zhuhai CosMX Power JinWan Subsidiary Co., Ltd. 珠海冠宇电源有限公司金湾分公司
Factory address: 生产厂地址:	Workshop No.1, No.2, No.3 (first, fourth and fifth floors) and No.5, No.3 Qingwansanlu Road, Qingwan Industry Park, Sanzao Town, Jinwan District, Zhuhai City, Guangdong, P. R. China 广东省珠海市金湾区三灶镇青湾工业区青湾三路3号的厂房一、厂房二、厂房三 (一层、四层、五层)、厂房五
Appearance: 样品外观颜色:	Black 黑色的
Sample status: 样品状态:	Good 完好
Quantity of sample: 样品数量:	46Pcs
Sample identification: 样品标识序号:	C1#~C46#
Receiving date: 接样日期:	2020.10.21
Completing date: 完成日期:	2020.11.03

Conclusion/结论:

The submitted samples comply with the requirements of UNITED NATIONS Section 38.3 Of The Sixth Revised Edition Amendment 1 Of The Recommendations On The Transport Of Dangerous Goods, Manual Of Test And Criteria (ST/SG/AC.10/11/Rev.6 Amend 1 Section 38.3)

样品符合联合国《关于危险货物运输的建议书试验和标准手册》第六版修正一第 38.3 节的要求。

Tested : 测试:	王忆 Wang Yi 王忆 Test Engineer 测试工程师	 Seal/检验专用章: Date of Issue: 2020.11.03 测试中心
Reviewed : 审核:	董家勤 Zhang Liang 张亮 Quality Manager 质量负责人 Dong Jiaqin 董家勤 Technical Manager 技术负责人	
Approved : 批准:	吴琼 Wu Qiong 吴琼 Dong Jiaqin 董家勤 Authorized Manager 授权签字人	

General product information

样品描述及说明

Sample Type:

样品类型:

Rechargeable or not

是否可充电

Yes

是

☐ Cell
电池
Use
用途

—

Electrochemistry
System
电池化学组分

—

☒ Battery
电池组
Use
用途Notebook
笔记本电脑Battery Model
型号

AP20CBL

Composing Mode
组成方式3S1P
3串1并Electrochemistry
System
电池化学组分LiCoO₂
钴酸锂Cell model
电池型号

CA478270G

Cell Capacity
电池容量Typ: 4660mAh
Min: 4525mAhManufacturer of Cell
电池生产厂Zhuhai CosMX Battery Co., Ltd.
珠海冠宇电池股份有限公司

Sample parameters:

样品参数:

Nominal Voltage
标称电压

11.55V

Rated Capacity
额定容量

4457mAh

Rated Energy
额定能量

51.47Wh

Limited Charging
Voltage
充电限制电压

13.2V

Max. Charging
Current
最大持续充电电流

5126mA

Standard Charging
Current
标准充电电流

2330mA

Discharge
Cut-off Voltage
放电终止电压

9.00V

Max. Discharging
Current
最大持续放电电流

7800mA

Charge Cut-off
Current
充电截止电流

230mA

Test Conclusion

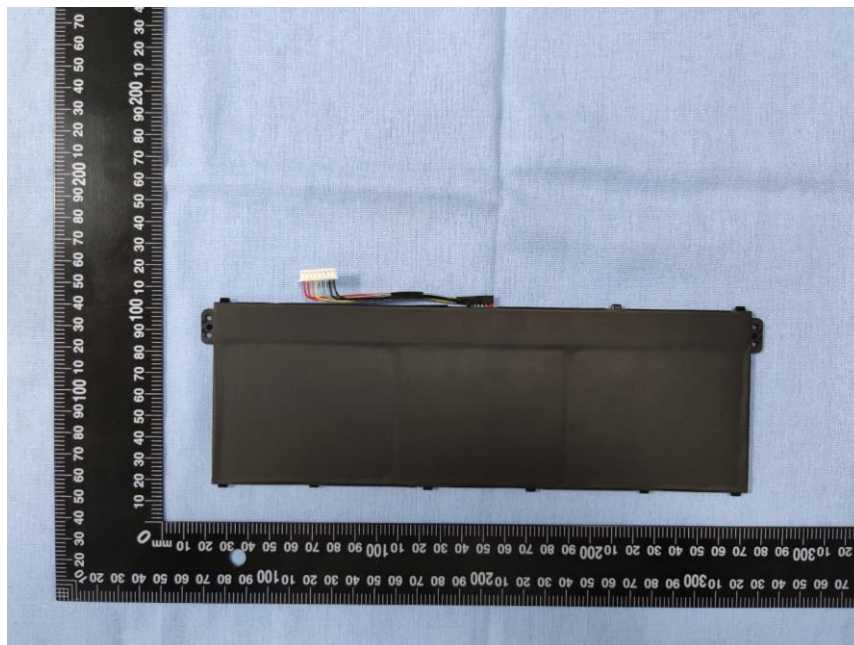
测试结论

No. 序号	Name of test 测试项目名称	The submitted samples comply with the requirements of UNITED NATIONS 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 Amend 1 Section 38.3) 样品符合联合国《关于危险货 物运输的建议书 试验和标准 手册》第六版修订一第38.3节 的要求。	Test result 测试结果	Conclusion 本项结论	Remarks 备注
1	Altitude simulation 高度模拟		See Appendix 1	P	
2	Thermal test 温度试验		See Appendix 2	P	
3	Vibration 振动		See Appendix 3	P	
4	Shock 冲击		See Appendix 4	P	
5	External Short- circuit 外部短路		See Appendix 5	P	
6	Impact 撞击		See Appendix 6	N/A	
	Crush 挤压		See Appendix 6	P	
7	Overcharge 过度充电		See Appendix 7	P	
8	Forced discharge 强制放电		See Appendix 8	P	

Photos of samples and markings

样品及标识照片

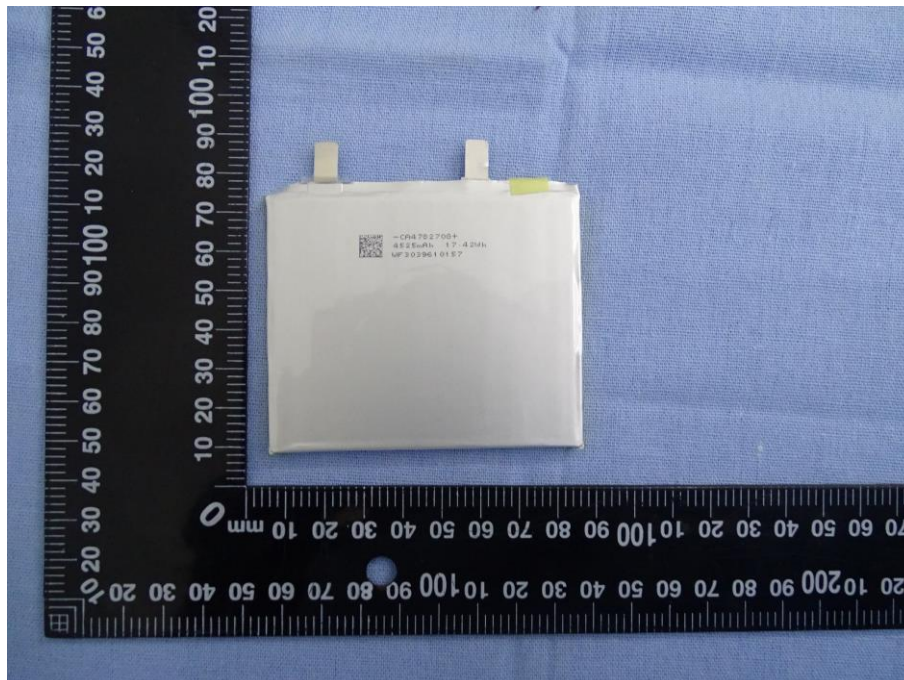
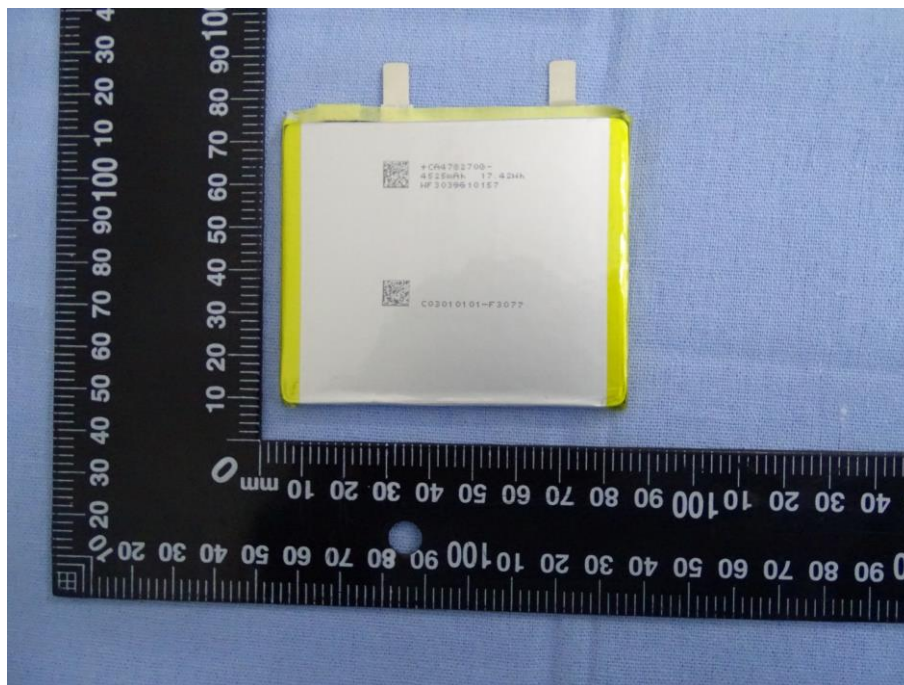
Battery (AP20CBL 11.55V 4457mAh 51.47Wh)



Photos of samples and markings

样品及标识照片

Cell (CA478270G 3.85V 4525mAh)



Appendix 1

附表 1

Test Items 测试项目	Altitude simulation 高度模拟						
1.1	Test procedure 测试步骤						
	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℃). 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的压力下至少六小时。						
1.2	Sample status 样品状态						
	C1# ~ C4#, at first cycle in fully charged states; C1# ~ C4#, 在第1个循环完全充电; C5# ~ C8#, after 25 cycle in fully charged states. C5# ~ C8#, 在第25个循环完全充电。						
1.3	Result 测试结果						
Sample No. 样品编号	Before Test测试前		After Test测试后		Mass loss 质量损失 (M<1g: 0.5% 1g≤M≤75g:0.2% M>75g: 0.1%)	Residual OCV 剩余电压 (≥90%)	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)			
C1#	209.80	12.986	209.71	12.983	0.0429%	99.9769%	O
C2#	209.65	12.982	209.55	12.980	0.0477%	99.9846%	O
C3#	209.31	12.983	209.20	12.980	0.0526%	99.9769%	O
C4#	209.54	12.982	209.48	12.979	0.0286%	99.9769%	O
C5#	208.86	12.986	208.78	12.983	0.0383%	99.9769%	O
C6#	209.44	12.984	209.38	12.982	0.0286%	99.9846%	O
C7#	209.21	12.989	209.15	12.986	0.0287%	99.9769%	O
C8#	209.56	12.985	209.51	12.982	0.0239%	99.9769%	O
Note: L-Leakage, V-Venting, D -Disassembly, R -Rupture, F-Fire, O-No leakage, no venting, no disassembly, no rupture, no fire. 注：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。							

附表 2

注: 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。

附表 3

注: 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

Test Items 测试项目	Shock 冲击						
1.1	Test procedure 测试步骤						
	<p>Test cells and batteries shall be secured to the testing machine, and each cell shall be subjected to a half-sine shock of peak acceleration of 150g_n and pulse duration of 6 milliseconds. Large cells may be subjected to a half-sine shock of peak acceleration of 50g_n and pulse duration of 11 milliseconds. Small batteries shall be subjected to a half-sine shock of peak acceleration of 150g_n (or Acceleration(g_n)= $\sqrt{\frac{100850}{mass}}$, which is smaller) and pulse duration of 6 milliseconds, large batteries shall be subjected to a half-sine of peak acceleration of 50g_n (or Acceleration(g_n)= $\sqrt{\frac{30000}{mass}}$, which is smaller) and pulse duration of 11 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</p> <p>以稳固的托架固定住每个电芯和电池样品的全部配件表面。对每个电芯以峰值为150g_n的半正弦的加速度撞击，脉冲持续6毫秒，大型电芯须经受最大加速度50g_n和脉冲持续时间11毫秒的半正弦波冲击。对每个电池以峰值为150g_n（或与$\sqrt{\frac{100850}{mass}}$中的较小值）的半正弦的加速度撞击，脉冲持续6毫秒，大型电池组须经受最大加速度50g_n（或与$\sqrt{\frac{30000}{mass}}$中的较小值）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。</p>						
1.2	Sample status 样品状态						
	<p>C1# ~ C4#, at first cycle in fully charged states; C1# ~ C4#, 在第1个循环完全充电； C5# ~ C8#, after 25 cycle in fully charged states. C5# ~ C8#, 在第25个循环完全充电。</p>						
1.3	Result 测试结果						
Sample No. 样品编号	Before Test测试前		After Test测试后		Mass loss 质量损失 (M<1g: 0.5% 1g≤M≤75g:0.2% M>75g: 0.1%)	Residual OCV 剩余电压 (≥90%)	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)			
C1#	209.67	12.748	209.65	12.746	0.0095%	99.9843%	O
C2#	209.50	12.743	209.47	12.740	0.0143%	99.9765%	O
C3#	209.17	12.741	209.17	12.740	0.0000%	99.9922%	O
C4#	209.41	12.744	209.40	12.742	0.0048%	99.9843%	O
C5#	208.75	12.748	208.73	12.746	0.0096%	99.9843%	O
C6#	209.35	12.745	209.34	12.742	0.0048%	99.9765%	O
C7#	209.10	12.747	209.10	12.745	0.0000%	99.9843%	O
C8#	209.48	12.745	209.47	12.743	0.0048%	99.9843%	O
Note: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire, O-No leakage, no venting, no disassembly, no rupture, no fire.							
注: 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

Test Items 测试项目	External short circuit 外部短路		
1.1	Test procedure 测试步骤		
	<p>The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches $57\pm4^{\circ}\text{C}$ 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 $57\pm4^{\circ}\text{C}$. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to $57\pm4^{\circ}\text{C}$, the cell or battery must be observed for a further six hour for the test to be concluded.</p> <p>保持试验环境温度稳定在$57\pm4^{\circ}\text{C}$，以使电芯或电池样品外表温度达到$57\pm4^{\circ}\text{C}$，然后，在此温度下，将其正负极用小于0.1欧姆的线路短接，待电芯或电池的外表温度恢复到$57\pm4^{\circ}\text{C}$之后再持续1小时以上，对电芯或电池必须进一步观察6个小时才能下结论。</p>		
1.2	Sample status 样品状态		
	<p>C1# ~ C4#, at first cycle in fully charged states; C1# ~ C4#, 在第1个循环完全充电; C5# ~ C8#, after 25 cycle in fully charged states. C5# ~ C8#, 在第25个循环完全充电。</p>		
1.3	Result 测试结果		
Sample No. 样品编号	Max. External Temperature 样品表面最高温度($^{\circ}\text{C}$)	Test result 测试结果	Remark 备注
C1#	58.4	O	
C2#	57.7	O	
C3#	57.9	O	
C4#	57.9	O	
C5#	57.8	O	
C6#	58.0	O	
C7#	58.1	O	
C8#	58.0	O	
Note: D –Disassembly, R –Rupture, F –Fire, OT –Over Temperature, O –no disassembly, no rupture, no fire, no Over temperature 注: D- 解体; R- 破裂; F- 起火; OT- 超过 170°C ; O- 无解体、无破裂、无起火、不超过 170°C			

Appendix 6

附表 6

Test Items 测试项目	Impact 撞击/Crush 挤压
1.1	<p>Test procedure 测试步骤</p> <p>Impact 撞击 (applicable to cylindrical cells not less than 18mm in diameter) The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm \pm 0.1 mm 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 \pm 0.1 kg mass is to be dropped from a height of 61 \pm 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 \pm 0.1 mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact. 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. (适用于直径不小于18毫米的圆柱形电池) 将电池或元件电池样品平放在一个平面上, 其纵轴平行于测试台面, 将一直径为15.8 mm \pm 0.1 mm的316型不锈钢棒横放在电池中心位置。然后, 将一质量为9.1 kg \pm 0.1 kg的物体从61\pm2.5 cm的高度落向样品。样品在进行试验时, 其外表温度应不超过170°C。且试验结束后6个小时之内, 样品应无解体、无起火现象发生。</p> <p>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 13kN\pm0.78kN; (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 100mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.</p>

Appendix 6

附表 6

Test Items 测试项目	Impact 撞击/Crush 挤压		
	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： (a)作用力达到 13kN±0.78kN； (b)电池芯电压降至少达到100mV； (c)电池厚度和最初比较变形至少50%。 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。		
1.2	Sample status 样品状态		
	C9# ~ C13#, at first cycle at 50% of the design rated capacity; C9# ~ C13#, 在第1个循环充50%的额定容量； C14# ~ C18#, after 25 cycle at 50% of the design rated capacity. C14# ~ C18#, 在第25个循环充50%的额定容量。		
1.3	Result 测试结果		
Sample No. 样品编号	Max. External Temperature 样品表面最高温度(℃)	Test result 测试结果	Remark 备注
C9#	26.2	O	
C10#	26.1	O	
C11#	26.9	O	
C12#	26.1	O	
C13#	25.9	O	
C14#	26.0	O	
C15#	26.2	O	
C16#	25.7	O	
C17#	26.7	O	
C18#	26.4	O	
Note: D -Disassembly, R -Rupture, F-Fire, OT –Over Temperature, O- no disassembly, no fire, no Over temperature 注: D- 解体; R- 破裂; F- 起火; OT- 超过170℃; O-无解体、无起火、不超过170℃			

Appendix 7

附表 7

Test Items 测试项目	Overcharge 过度充电		
1.1	Test procedure 测试步骤		
	<p>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 or 22V, whichever is less. When the manufacturer's recommended charge voltage is more than 18V, the charging voltage of the test shall be 1.2 times maximum charge voltage. The charging current is 2 times of the maximum charging current recommended by the manufacturer.</p> <p>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是两倍的厂家标定最大充电电压或者是22V，取其中较小者。如果厂家推荐的充电电压超过18V，充电电压应该为 1.2倍的厂家标定最大充电电压。充电电流为厂家推荐的最大充电电流2倍。</p>		
1.2	Sample status 样品状态		
	<p>C19# ~ C22#, at first cycle in fully charged states; C19# ~ C22#, 在第1个循环完全充电; C23# ~ C26#, after 25 cycle in fully charged states. C23# ~ C26#, 在第25个循环完全充电。</p>		
1.3	Result 测试结果		
Sample No. 样品编号	Voltage Before test(V) 测试前开路电压(V)	Test result 测试结果	Remark 备注
C19#	13.069	O	
C20#	13.070	O	
C21#	13.069	O	
C22#	13.068	O	
C23#	13.071	O	
C24#	13.071	O	
C25#	13.073	O	
C26#	13.070	O	
<p>Note: D -Disassembly, F-Fire, O- no disassembly, no fire. 注: D- 解体; F - 起火; O-无解体、无起火。</p>			

Appendix 8

附表 8

Test Items 测试项目	Forced discharge 强制放电				
1.1	Test procedure 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 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±5℃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	Sample status 样品状态				
	C27# ~ C36#, at first cycle in fully discharged states; C27# ~ C36#, 在第1个循环完全放电; C37# ~ C46#, after 25 cycles ending in fully discharged states. C37# ~ C46#, 在第25个循环完全放电。				
1.3	Result 测试结果				
Sample No. 样品编号	Voltage Before test 测试前开路电压 (V)	Test result 测试结果	Sample No. 样品编号	Voltage Before test 测试前开路电压 (V)	Test result 测试结果
C27#	3.372	O	C37#	3.370	O
C28#	3.370	O	C38#	3.367	O
C29#	3.365	O	C39#	3.369	O
C30#	3.369	O	C40#	3.367	O
C31#	3.369	O	C41#	3.373	O
C32#	3.363	O	C42#	3.367	O
C33#	3.361	O	C43#	3.359	O
C34#	3.365	O	C44#	3.371	O
C35#	3.373	O	C45#	3.377	O
C36#	3.358	O	C46#	3.354	O
Note: D -Disassembly, F -Fire, O - no disassembly, no fire. 注: D- 解体; F - 起火; O-无解体、无起火。					

Test equipment list

仪器设备清单

No. 序号	Name 名称	Type 型号	Equipment No. 编号	Calibration Date 校准有效期至	Used 本次使用 (√)
1	Battery Charge And Discharging Tester 蓝电电池测试系统	CT3001H	GYA-E-1639	2021-01-06	√
2	Battery Charge And Discharging Tester 瑞能电池测试系统	ACTS 20V10A-GGS	GYA-E-1788	2021-06-18	√
3	Low Pressure Chamber 电池低压高空模拟试验箱	GX-3020-Z	GYA-O-039	2021-05-27	√
4	Rapid Temperature Test 程式快速温变试验箱	GK-RTH150C	GYA-T-0243	2021-08-19	√
5	Vibration Platform 电动振动试验机	FS-10-240	GYA-O-0298	2021-07-15	√
6	Shock Platform 气动垂直冲击碰撞试验台	SY11-25	GYA-F-146	2021-09-13	√
7	Multi channel short circuit 电池短路试验机	GK-8048	GYA-T-0245	2021-10-13	√
8	Crush Platform 伺服挤压机试验机	BE-6045-2T	GYA-F-288	2021-05-20	√
9	DC regulated power supply 直流稳压电源	IT6522A	GYA-E-1616	2020-12-09	√
10	DC regulated power supply 直流稳压电源	IT6512	GYA-E-1692	2021-02-23	√
11	DC regulated power supply 直流稳压电源	IT6512	GYA-E-1690	2021-02-23	√
12	DC regulated power supply 直流稳压电源	IT6512	GYA-E-1691	2021-02-23	√
13	DC regulated power supply 直流稳压电源	IT6163	GYA-E-1271	2021-01-06	√
14	DC electronic load 直流电子负载	IT8816	GYA-E-1617	2020-12-09	√
15	DC electronic load 直流电子负载	IT8816	GYA-E-1693	2021-02-23	√



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No. 序号	Name 名 称	Type 型号	Equipment No. 编 号	Calibration Date 校准有效期至	Used 本次使用 (√)
16	Electronic Scale 电子天平	GS2202	GYA-F-0667	2021-04-19	√
17	Digital multimeter 数字多用表	34401A	GYA-E-0207	2020-11-13	√
18	Data Collector 数据采集仪	HIOKI	GYA-E-714	2021-08-19	√
19	Data Collector 数据采集仪	HIOKI	GYA-E-1705	2021-03-19	√

注 意 事 项

Attention

1. 本报告无检测单位“检验专用章”无效。
The test report is invalid without the official stamp of the lab.
2. 未经本实验室书面同意，不得部分地复制本报告。
Nobody is allowed to photocopy or partly photocopy this report without written permission of the lab.
3. 本报告无批准人、审核人签名无效。
The test report is invalid without the signature of ratifier, reviewer.
4. 本报告涂改无效。
The test report is invalid if altered.
5. 如果报告中部分项目相对于测试依据有偏离的，将在当前测试项目中予以说明。
If any test method is deviation from the designated test method, must be commented in the test data sheet.
6. 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 lab within 15 days.
7. 本报告仅对送检样品负责。
The test report is valid for the tested sample only.
8. 本检测结果中“N/A”表示“不适用”，“P”表示“通过”，“F”表示“不通过”。
As for the test result “N/A” means “Not Applicable”, “P” means “Pass” and “F” means “Fail”.

珠海冠宇电池股份有限公司测试中心

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报告结束

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