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报告编号(Report ID): MDI4SYQU13864521

锂电池 UN38.3 测试报告

Lithium Battery UN38.3 Test Report

Sample Description & Model	Li-ion Battery KB-5C
Applicant	Quanzhou KAILI electronics co., LTD
Manufacturer	Quanzhou KAILI electronics co., LTD

Pony Testing International Group

I、 SAMPLE DESCRIPTION

Sample Description	Li-ion Battery		Sample Model	KB-5C	
Applicant	Quanzhou KAILI electronics co., LTD				
Manufacturer	Quanzhou KAILI electronics co., LTD				
Nominal Voltage	3.7V	Rated Capacity	1500mAh	Limited Charge Voltage	4.2V
Charge Current	300mA	Maximum Continuous Charge Current	1500mA	End Charge Current	30mA
Cut-off Voltage	3.0V	Maximum Discharge Current	1500mA	Use	Mobile phone battery
Cell Number In Each Battery	1PCS	Cell Model	523450AR	Cell Capacity	1500mAh
Manufacturer of cell	Quanzhou KAILI electronics co., LTD				
Entrust date	2016-08-03		Finished date	2016-08-26	

II、 TEST METHOD

《United Nations Recommendations On The Transport Of Dangerous Goods, Manual Of Tests And Criteria》(ST/SG/AC.10/11/Rev.6, 38.3).

III、 TEST ITEM

1. Altitude simulation
2. Thermal test
3. Vibration
4. Shock
5. External short circuit
6. Crush
7. Overcharge
8. Forced discharge

IV、 CONCLUSION

ITEM	SAMPLE NUMBER	STANDARD	CONCLUSION
Altitude simulation	N1~N10	UN38.3 ST/SG/AC.10/11/Rev.6	PASS
Thermal test			PASS
Vibration			PASS
Shock			PASS
External short circuit			PASS
Crush	N11~N15		PASS
Overcharge	N16~N19 C1~C4		PASS
Forced discharge	N20~N29 C5~C14		PASS

The Samples has passed the test items of UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Manual of Tests and Criteria, ST/SG/AC.10/11/Rev.6.

Prepared by: Checked by: Approved by:

Issue Date: August 26, 2016

Notes:

N1~N10, N16~N19: Cells at first cycle in fully charged states;

N11~N15: Cells at first cycle at 50% of the design rated capacity;

N20~N29: Cells at first cycle in fully discharged states;

C1~C4: Cells after 50 cycles ending in fully charged states;

C5~C14: Cells after 50 cycles ending in fully discharged states.

V、 PHOTO OF THE SAMPLE

Authenticate the photo on original report only

VI、 TEST METHOD

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.

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

$$Mass\ loss(\%) = (M_1-M_2) / M_1 \times 100$$

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".

Mass M of cell or battery	Mass loss limit
M＜1g	0.5%
1g≤M≤75g	0.2%
M＞75g	0.1%

T.1 Altitude simulation

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).

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.

T.2 Thermal test

Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 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.

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.

T.3 Vibration

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 waveform 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 positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries).

For cells and small batteries: from 7 Hz a peak acceleration of 1 g_n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 g_n occurs (approximately 50 Hz).

A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200 Hz.

For large batteries: from 7 Hz to a peak acceleration of 1 g_n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 g_n occurs (approximately 25 Hz). A peak acceleration of 2 g_n is then maintained until the frequency is increased to 200 Hz.

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 after testing in its 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.

T.4 Shock

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 shall be subjected to a half-sine shock of peak acceleration of 150 g_n and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 g_n and pulse duration of 11 milliseconds.

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 millisecondsfor small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.

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.

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.

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.

T.5 External short circuit

The cell or battery to be tested shall be shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57±4℃, 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℃ shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57±4℃, 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.

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.

T.6 Impact / Crush

Impact (applicable to cylindrical cells not less than 18 mm in diameter)

The test 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.

Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18 mm in diameter)

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;

(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.

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.

T.7 Overcharge

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.

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

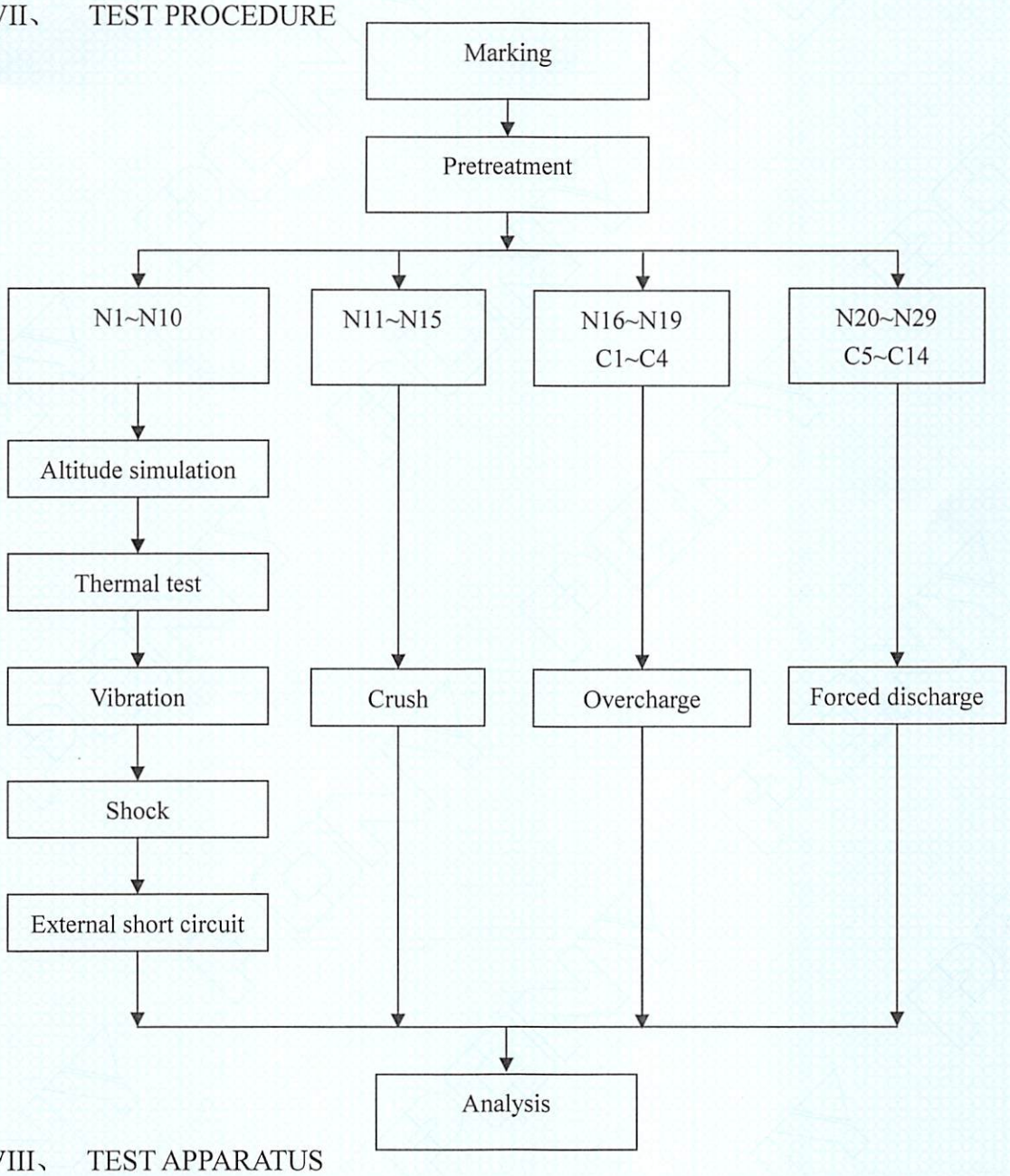
T.8 Forced discharge

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).

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.

VII、 TEST PROCEDURE



VIII、 TEST APPARATUS

IE-0121 Rechargeable battery test system
IE-0434 Vacuum chamber
IE-0090 Digital multimeter
IE-0259 Electronic balance
IE-0328 Temperature change chamber
IE-0287 Shock test instrument
IE-0281 Temperature control circuit tester
IE-0185 Thermoelectric pair
IE-0198 Battery extrusion needling machine
IE-0511 DC regulated power supply
IE-0503 Electrodynamamic type vibration test instrument
IE-0077 TPR series high precision DC regulated power supply

IX、 DATA

1. Altitude simulation

No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
N1	21.820	4.161	21.819	4.160	0.005	0.024	N
N2	21.541	4.166	21.539	4.165	0.009	0.024	N
N3	21.570	4.165	21.569	4.164	0.005	0.024	N
N4	21.575	4.167	21.575	4.166	0.000	0.024	N
N5	21.715	4.164	21.715	4.164	0.000	0.000	N
N6	21.486	4.160	21.485	4.160	0.005	0.000	N
N7	21.653	4.165	21.653	4.164	0.000	0.024	N
N8	21.660	4.166	21.660	4.165	0.000	0.024	N
N9	21.985	4.166	21.984	4.165	0.005	0.024	N
N10	21.514	4.166	21.513	4.164	0.005	0.048	N

2. Thermal test

No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
N1	21.819	4.160	21.818	4.132	0.005	0.673	N
N2	21.539	4.165	21.539	4.135	0.000	0.720	N
N3	21.569	4.164	21.569	4.134	0.000	0.720	N
N4	21.575	4.166	21.574	4.138	0.005	0.672	N
N5	21.715	4.164	21.715	4.135	0.000	0.696	N
N6	21.485	4.160	21.484	4.130	0.005	0.721	N
N7	21.653	4.164	21.653	4.135	0.000	0.696	N
N8	21.660	4.165	21.660	4.136	0.000	0.696	N
N9	21.984	4.165	21.984	4.138	0.000	0.648	N
N10	21.513	4.164	21.512	4.138	0.005	0.624	N

3. Vibration

No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
N1	21.818	4.132	21.818	4.131	0.000	0.024	N
N2	21.539	4.135	21.538	4.135	0.005	0.000	N
N3	21.569	4.134	21.569	4.132	0.000	0.048	N
N4	21.574	4.138	21.574	4.138	0.000	0.000	N
N5	21.715	4.135	21.715	4.135	0.000	0.000	N
N6	21.484	4.130	21.484	4.130	0.000	0.000	N
N7	21.653	4.135	21.652	4.135	0.005	0.000	N
N8	21.660	4.136	21.660	4.136	0.000	0.000	N
N9	21.984	4.138	21.984	4.138	0.000	0.000	N
N10	21.512	4.138	21.512	4.137	0.000	0.024	N

4. Shock

No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
N1	21.818	4.131	21.818	4.131	0.000	0.000	N
N2	21.538	4.135	21.537	4.135	0.005	0.000	N
N3	21.569	4.132	21.568	4.132	0.005	0.000	N
N4	21.574	4.138	21.574	4.137	0.000	0.024	N
N5	21.715	4.135	21.715	4.135	0.000	0.000	N
N6	21.484	4.130	21.484	4.130	0.000	0.000	N
N7	21.652	4.135	21.652	4.134	0.000	0.024	N
N8	21.660	4.136	21.659	4.136	0.005	0.000	N
N9	21.984	4.138	21.984	4.138	0.000	0.000	N
N10	21.512	4.137	21.511	4.137	0.005	0.000	N

5. External short circuit

No.	Peak temperature (℃)	Whether disassembly, rupture, fire (Y/N)
N1	57.2	N
N2	57.3	N
N3	57.5	N
N4	57.4	N
N5	57.1	N
N6	57.1	N
N7	57.6	N
N8	57.4	N
N9	57.2	N
N10	57.3	N

6. Crush

No.	Peak temperature (℃)	Whether disassembly, fire (Y/N)
N11	24.5	N
N12	24.7	N
N13	24.8	N
N14	24.5	N
N15	24.5	N

7. Overcharge

No.	Whether disassembly, fire (Y/N)
N16	N
N17	N
N18	N
N19	N
C1	N
C2	N
C3	N
C4	N

8. Forced discharge

No.	Whether disassembly, fire (Y/N)
N20	N
N21	N
N22	N
N23	N
N24	N
N25	N
N26	N
N27	N
N28	N
N29	N
C5	N
C6	N
C7	N
C8	N
C9	N
C10	N
C11	N
C12	N
C13	N
C14	N

*** End of report ***