惠州基安比新能源有限公司
Huizhou Markyn New Energy Co., LTD.

锂电池UN38.3测试报告
Lithium Battery UN38.3 Test Report

Sample Description & Model Polymer Li-ion Cell GMB602025

Applicant Huizhou Markyn New Energy Co., Ltd.

Manufacturer Huizhou Markyn New Energy Co., Ltd.

1. SAMPLES DESCRIPTION

Sample Description	Polymer Li-ion Cell	Sample Model	GMB602025		
Applicant	Huizhou Markyn New Energy Co., Ltd				
Manufacturer	Huizhou Markyn New Energy Co., Ltd				
Nominal Voltage	3.7v	Rated Capacity	250mAh	Limited Charge Voltage	4.2V
Charge Current	250mA	Maximum Continuous Current	250mA	End Charge Current	250mA
Cut-off Voltage	3.0V	Maximum Discharge Current	250mA	**Use**	Digital Production
Cells Number	1PCS	Cell Model	GMB602025	Cell Capacity	250mAh
Manufacturer of cell	GMB				
Chemical components	LiCoO2				
Client date	2016.12.1	Finish date	2016.12.9		

II REFERENCE METHOD

United Nations Recommendations On The Transport Of Dangerous Goods,Manual Of Tests And Criteria .（ST/SG/AC.10/11/Rev.5/Amend.1 & ST/SG/AC.10/11/Rev.5/Amend.2）

III TEST ITEM

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

IV CONCLUSION

ITEM	SAMPLE NUMBER	STANDARD	CONCLUSION
Altitude simulation	N1~N10	UN38.3	PASS
Thermal test			PASS
Vibration			PASS
Shock			PASS
External short circuit			PASS
Crush	N11~N15		PASS
Forced discharge	N20~N29 C5~C14		PASS

The submitted cell and component cell complied with the UN Manual of Tests and Criteria,part III,sub-section 38.3.

Prepared by : Checked by Approved by

Issue Date: 2016-12-9

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 after 50 cycles 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.S shall be conducted in sequence on the same cell or battery. Tests T.6 and T.7 shall be conducted using not otherwise tested cells or batteries.test

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

Mass loss (%)=(M1-M2)/M1*100

Where M1 is the mass before the test and M2 is the mass after the test .When mass loss does not exceed the values in Table blow, it shall be considered Al “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℃)

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% for 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℃，followed by storage for at least six hours at a test temperature equal to -40±2℃.The maximum time intervals 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℃)。For large cells and batteries the duration if 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 stages.

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 7Hz and 200Hz and back to 7Hz traversed in 15 minutes. This cycle shall be repeated 12 times 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 7Hz a peak acceleration of 1gn is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm(1.6mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs（approximately 50 Hz）.

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

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

Cells and batteries meet this requirement if there is no leakage, no disassembly, no rupture and fire during 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 application 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 or battery shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the 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 50 gn 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 position of the cell for a total of 18 shocks.

Cells and batteries meet this requirement if there no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test 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 and batteries at fully discharged states.

T.5 External short circuit

The cell or battery to be tested shall be temperature stabilized 55±2℃ 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 55±2℃.This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55±2℃.

Cells and batteries meet this requirement if their external temperature does not exceed 170℃ 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 18mm in diameter)

The sample cell or component cell is to be placed dimension of the cell, whichever is greater , type 316 stainless stell bar is to be placed across the center of the sample, A9.1kg±0.1kg mass is to be dropped from a height of 61±2.5 cn at the intersection of the bar and sample in a controlled manner using a near friction less, 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 fro 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 15.8mm±0.1mm diameter curved surface lying across the center 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 18mm 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 approximate 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 13kNz﹢0.78kN;

(b) The voltage of the cell drops by at least 100mv; 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.

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 6H. 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 requirements if their external temperature does not exceed 170℃ and there is no disassembly and no fire during the test and within six hours after this test.

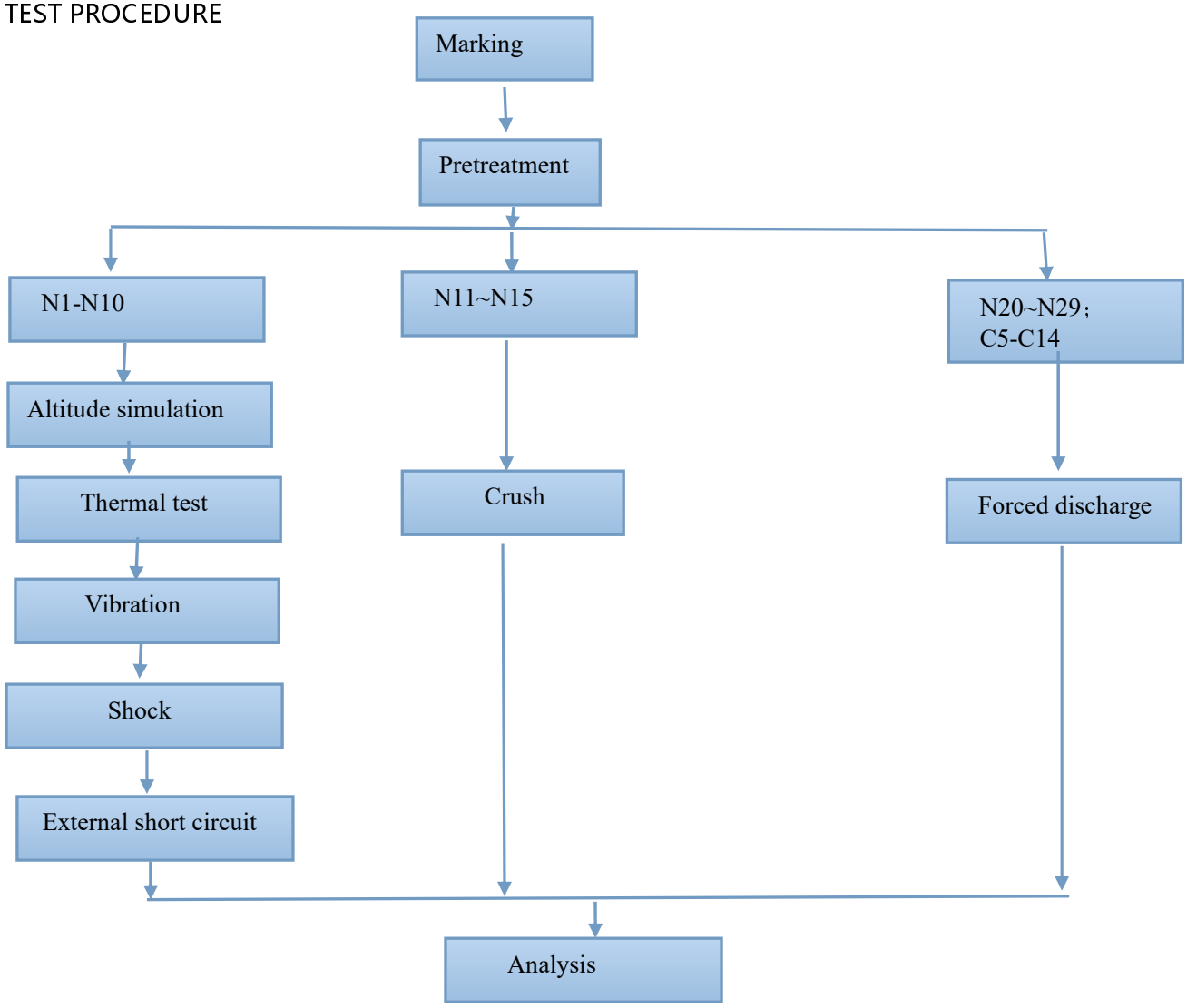
T.7 Forced discharge

Each cells 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-0294 DC regulated power supply
IE-0434 Vacuum chamber
IE-0198 Battery extrusion needling machine
IE-0219 Temperature circulation chamber chamber
IE-0125 Electronic balance
IE-0128 Vibration test instrument
IE-0090 Digital multimeter
IE-0287 Shock test instrument
IE-0185 Thermoelectric pair
IE0281 Battery anti-explosion

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	6.058	3.83	6.058	3.83	0.000	0.000	N
N2	6.055	3.86	6.055	3.84	0.000	0.518	N
N3	6.022	3.80	6.022	3.80	0.000	0.000	N
N4	6.012	3.81	6.012	3.81	0.000	0.000	N
N5	6.066	3.82	6.066	3.81	0.000	0.257	N
N6	6.072	3.90	6.072	3,89	0.000	0.257	N
N7	6.082	3.89	6.082	3.88	0.000	0.257	N
N8	6.055	3.88	6.055	3.88	0.000	0.000	N
N9	6.026	3.81	6.026	3.81	0.000	0.000	N
N10	6.052	3.80	6.052	3.80	0.000	0.000	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	6.058	3.83	6.058	3.83	0.000	0.000	N
N2	6.055	3.86	6.055	3.84	0.000	0.518	N
N3	6.022	3.80	6.022	3.80	0.000	0.000	N
N4	6.012	3.81	6.012	3.81	0.000	0.000	N
N5	6.066	3.82	6.066	3.81	0.000	0.257	N
N6	6.072	3.90	6.072	3,89	0.000	0.257	N
N7	6.082	3.89	6.082	3.88	0.000	0.257	N
N8	6.055	3.88	6.055	3.88	0.000	0.000	N
N9	6.026	3.81	6.026	3.81	0.000	0.000	N
N10	6.052	3.80	6.052	3.80	0.000	0.000	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	6.058	3.83	6.058	3.83	0.000	0.000	N
N2	6.055	3.86	6.055	3.84	0.000	0.518	N
N3	6.022	3.80	6.022	3.80	0.000	0.000	N
N4	6.012	3.81	6.012	3.81	0.000	0.000	N
N5	6.066	3.82	6.066	3.81	0.000	0.257	N
N6	6.072	3.90	6.072	3,89	0.000	0.257	N
N7	6.082	3.89	6.082	3.88	0.000	0.257	N
N8	6.055	3.88	6.055	3.88	0.000	0.000	N
N9	6.026	3.81	6.026	3.81	0.000	0.000	N
N10	6.052	3.80	6.052	3.80	0.000	0.000	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	6.058	3.83	6.058	3.83	0.000	0.000	N
N2	6.055	3.86	6.055	3.84	0.000	0.518	N
N3	6.022	3.80	6.022	3.80	0.000	0.000	N
N4	6.012	3.81	6.012	3.81	0.000	0.000	N
N5	6.066	3.82	6.066	3.81	0.000	0.257	N
N6	6.072	3.90	6.072	3,89	0.000	0.257	N
N7	6.082	3.89	6.082	3.88	0.000	0.257	N
N8	6.055	3.88	6.055	3.88	0.000	0.000	N
N9	6.026	3.81	6.026	3.81	0.000	0.000	N
N10	6.052	3.80	6.052	3.80	0.000	0.000	N

5. External short circuit

NO.	Peak temperature (℃)	Whether disassembly, rupture, fire (Y/N)
N1	56	N
N2	59	N
N3	57	N
N4	58	N
N5	56	N
N6	57	N
N7	59	N
N8	57	N
N9	56	N
N10	58	N

6. Crush

NO.	Peak temperature (℃)	Whether disassembly, fire (Y/N)
N11	26.9	N
N12	28	N
N13	27	N
N14	29	N
N15	28.3	N

7. 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*****