Lithium Battery UN38.3 Test Report

Report No.: A001B20180921010

Samples	**Polymer lithium battery**
Model	382035P
Client	Seeed Technology Co.,Ltd
Issue Date	2018-09-21

深圳市鑫宇环检测有限公司

Attestation of Global Compliance (Shenzhen) Co., Ltd.

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Ⅰ. SAMPLE DESCRIPTION					
Samples Name	Li Polymer Battery		Model Name	382035P	
Applicant	Seeed Technology Co.,Ltd				
Manufacturer	Shenzhen Netseah Technology Co.,Ltd				
Battery Type	Rechargeable Single Cell Battery	Nominal Voltage	3.7V	Rated Capacity	190mAh
Limited Charge Voltage	4.28V	Charge Current	38mA	Max. Continuous Charge Current	190mA
End Charge Current	20mA	Cut-off Voltage	2.75V	Max. Discharge Current	190mA
Cells Number	1pcs	Cell Model	382038P	Cell Rated Capacity	190mAh
Manufacturer of Cell	Shenzhen Netseah Technology Co.,Ltd				
Use	---	Client Date	2018-08-25	Completing Date	2018-09-19

Ⅱ. STANDARD

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

Ⅲ. TEST ITEM AND CONCLUSION

ITEM	SAMPLES NUMBER	STANDARD	CONCLUSION
Altitude simulation	Z1~Z10	UN 38.3	Pass
Thermal test			Pass
Vibration			Pass
Shock			Pass
External Short Circuit			Pass
Crush	Z11~Z15		Pass
Overcharge	Z16~Z19 X1~X4		Pass
Forced discharge	Z20~Z29 X5~X14		Pass

The submitted battery and component cell were complied with UN Manual of Tests and Criteria, Part III, sub-section 38.3.

Tested by		Reviewed by		Approved by	

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Notes:

Z1~Z10, Z16~Z19: Cells at first cycle in fully charged states;

Z11~Z15: Cells at first cycle at 50% of the design rated capacity;

Z20~Z29: Cells at first cycle in fully discharged states;

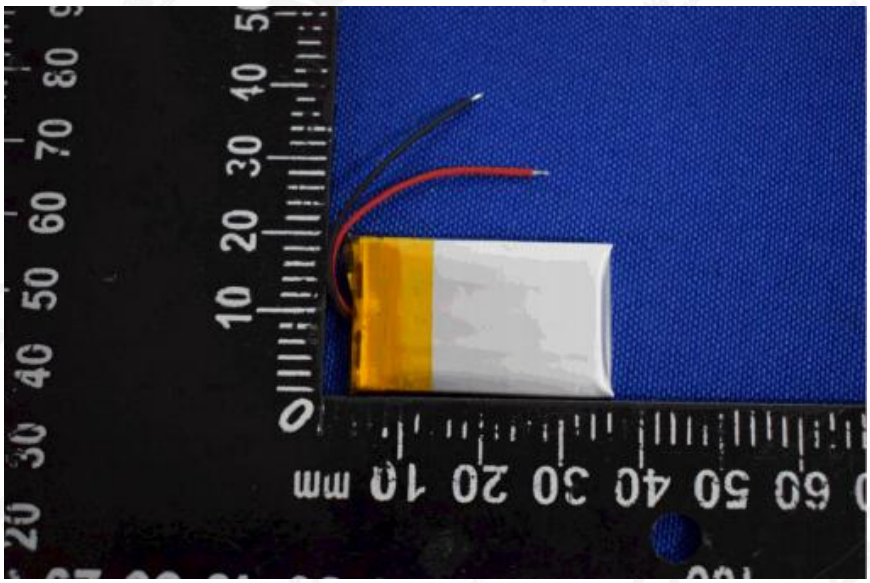
X1~X4: Cells after 50 cycles ending in fully charged states;

X5~X14: Cells after 50 cycles ending in fully discharged states.

Ⅳ. PHOTOS OF SAMPLE

Authenticate the photo on original report only





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V. TEST METHOD AND VERDICT

Clause	Requirements	Result	Verdict
38.3.4	**Procedure**		
38.3.4.1	**Test 1: Altitude simulation** 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℃) Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassemble, 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.	No leakage, no venting, no disassemble, no rupture and no fire. The data see Table1.	Pass
38.3.4.2	**Test 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 10 times, 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 mass loss, no leakage, no venting, no disassemble, 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.	No leakage, no venting, no disassemble, no rupture and no fire. The data see Table2.	Pass
38.3.4.3	**Test 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 is as follows: 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.	No leakage, no venting, no disassemble, no rupture and no fire. The data see Table3.	Pass

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Clause	Requirements	Result	Verdict
	Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassemble, 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.		
38.3.4.4	**Test 4: Shock**	No leakage, no venting, no disassemble, no rupture and no fire. The data see Table 4.	Pass
	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 g_n 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 50 g_n 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.		
	Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassemble, 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.		
38.3.4.5	**Test 5: External Short Circuit**	No disassemble, no rupture and no fire. The data see Table 5.	Pass
	The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 55 ± 2°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 55 ± 2 °C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55 ± 2°C. The cell or battery must be observed for a further six hours for the test to be concluded.		
	Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassemble, no rupture and no fire within six hours of this test.		

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Clause	Requirements	Result	Verdict
38.3.4.6	**Test 6: Impact / Crush**		
	Impact (applicable to cylindrical cells not less than 18mm in diameter) The Samples 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 Samples.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 Samples 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 Samples 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 Samples. Each Samples is to be subjected to only a single impact.	N/A	N/A
	Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassemble and no fire during the test and within six hours after this test.		
38.3.4.6	**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 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 Samples 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.	No disassemble, and no fire. The data see Table 6.	Pass
	Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassemble and no fire during the test and within six hours after this test.		

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Clause	Requirements	Result	Verdict
38.3.4.7	**Test 7: Overcharge**	No disassemble, and no fire. The data see Table 7.	Pass
	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 disassemble and no fire during the test and within seven days after the test.		
38.3.4.8	**Test 8: Forced discharge**	No disassemble and no fire. The data see Table 8.	Pass
	Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V 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 disassemble and no fire during the test and within seven days after the test.		

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Ⅵ. DATA

Table 1	Altitude simulation						Pass（合格）
No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassemble, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
Z1	4.926	4.191	4.924	4.187	0.041	99.905	Pass
Z2	4.922	4.189	4.921	4.184	0.020	99.881	Pass
Z3	4.955	4.192	4.953	4.187	0.040	99.881	Pass
Z4	4.917	4.190	4.916	4.184	0.020	99.857	Pass
Z5	4.931	4.191	4.930	4.185	0.020	99.857	Pass
Z6	4.940	4.192	4.938	4.188	0.040	99.905	Pass
Z7	4.907	4.193	4.950	4.187	0.041	99.857	Pass
Z8	4.995	4.190	4.994	4.185	0.020	99.881	Pass
Z9	4.907	4.189	4.905	4.184	0.041	99.881	Pass
Z10	4.962	4.193	4.960	4.189	0.040	99.905	Pass

Table 2	Thermal test						Pass（合格）
No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassemble, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
Z1	4.924	4.187	4.290	4.146	0.081	99.021	Pass
Z2	4.921	4.184	4.919	4.140	0.041	99.948	Pass
Z3	4.953	4.187	4.949	4.146	0.081	99.021	Pass
Z4	4.930	4.184	4.914	4.144	0.041	99.044	Pass
Z5	4.938	4.185	4.928	4.145	0.041	99.044	Pass
Z6	4.950	4.188	4.934	4.146	0.081	99.997	Pass
Z7	4.905	4.187	4.901	4.145	0.082	99.997	Pass
Z8	4.994	4.185	4.992	4.146	0.040	99.068	Pass
Z9	4.905	4.184	4.901	4.148	0.082	99.140	Pass
Z10	4.960	4.189	4.956	4.154	0.081	99.950	Pass

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Table 3	Vibration						Pass（合格）
No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassemble, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
Z1	4.920	4.146	4.919	4.141	0.020	99.879	Pass
Z2	4.919	4.140	4.917	4.137	0.041	99.928	Pass
Z3	4.949	4.146	4.947	4.142	0.040	99.904	Pass
Z4	4.914	4.144	4.913	4.140	0.020	99.903	Pass
Z5	4.928	4.145	4.927	4.141	0.020	99.903	Pass
Z6	4.934	4.146	4.932	4.142	0.041	99.904	Pass
Z7	4.901	4.145	4.900	4.139	0.020	99.855	Pass
Z8	4.992	4.146	4.991	4.142	0.020	99.904	Pass
Z9	4.901	4.148	4.899	4.144	0.041	99.904	Pass
Z10	4.956	4.145	4.955	4.140	0.020	99.855	Pass

Table 4	Shock						Pass（合格）
No.	Pre-test		After test		Mass loss (%)	Voltage loss (%)	Whether leakage, venting, disassemble, rupture, fire (Y/N)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
Z1	4.919	4.141	4.917	4.136	0.041	99.879	Pass
Z2	4.917	4.137	4.916	4.132	0.020	99.879	Pass
Z3	4.947	4.142	4.945	4.139	0.040	99.928	Pass
Z4	4.913	4.140	4.912	4.137	0.020	99.928	Pass
Z5	4.927	4.141	4.926	4.136	0.020	99.879	Pass
Z6	4.932	4.142	4.930	4.138	0.041	99.903	Pass
Z7	4.900	4.139	4.998	4.134	0.041	99.879	Pass
Z8	4.991	4.142	4.990	4.133	0.020	99.903	Pass
Z9	4.999	4.144	4.997	4.139	0.041	99.879	Pass
Z10	4.955	4.140	4.954	4.134	0.020	99.855	Pass

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Table 5	External short circuit	Pass（合格）
No.	Peak temperature (℃)	Whether disassemble, rupture, fire (Y/N)
Z1	58.0	Pass
Z2	57.8	Pass
Z3	58.1	Pass
Z4	58.0	Pass
Z5	57.9	Pass
Z6	57.7	Pass
Z7	57.9	Pass
Z8	57.6	Pass
Z9	57.9	Pass
Z10	58.1	Pass

Table 6	Crush	Pass（合格）
No.	Peak temperature (℃)	Whether disassemble, fire (Y/N)
Z11	24.5	Pass
Z12	24.6	Pass
Z13	24.5	Pass
Z14	24.8	Pass
Z15	24.7	Pass

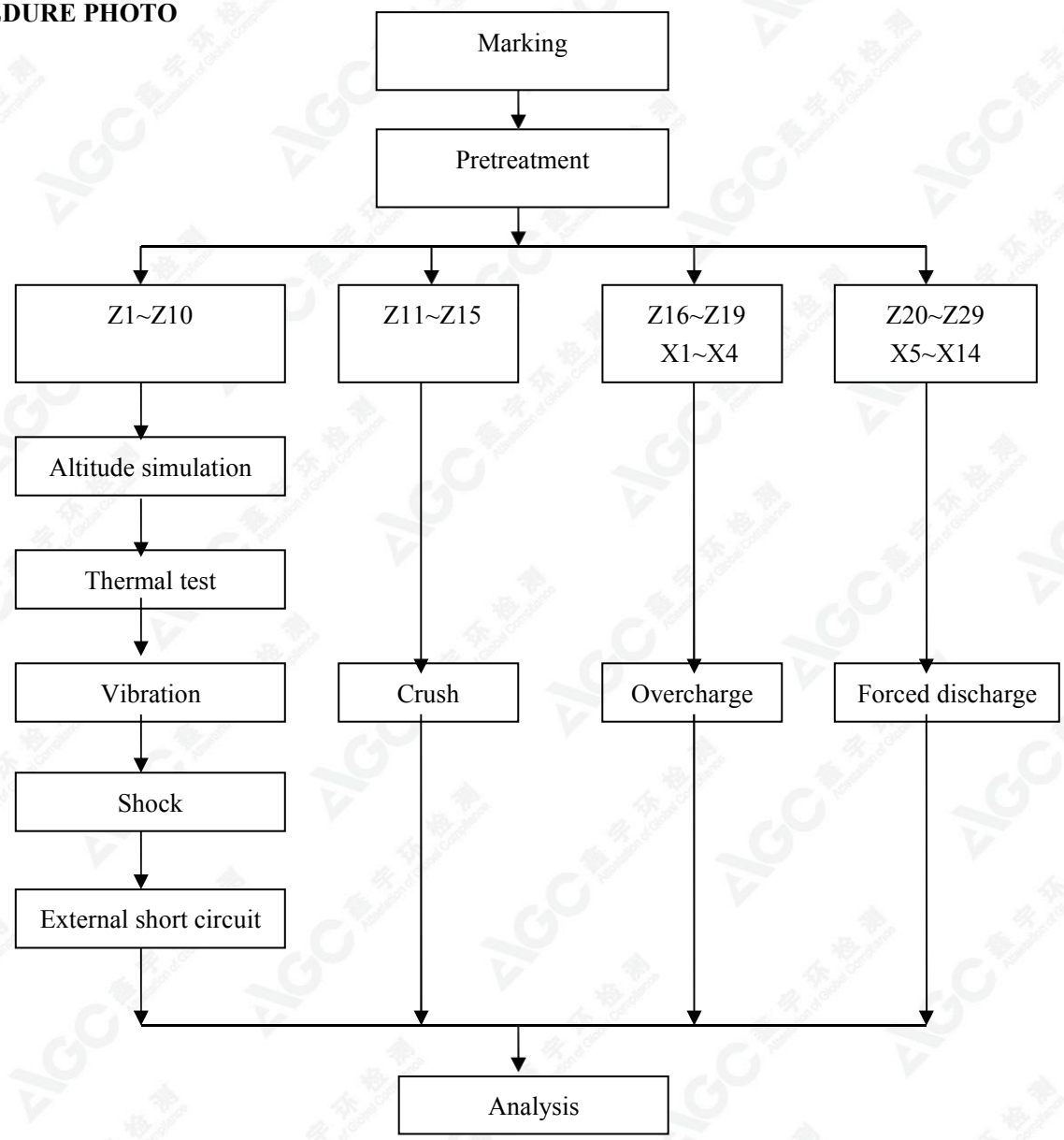
Table 7	Overcharge	Pass（合格）
No.	Whether disassemble, fire (Y/N)	
Z16	Pass	
Z17	Pass	
Z18	Pass	
Z19	Pass	
X1	Pass	
X2	Pass	
X3	Pass	
X4	Pass	

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Table 8	Forced discharge	Pass（合格）
No.	Whether disassemble, fire (Y/N)	
Z20	Pass	
Z21	Pass	
Z22	Pass	
Z23	Pass	
Z24	Pass	
Z25	Pass	
Z26	Pass	
Z27	Pass	
Z28	Pass	
Z29	Pass	
X5	Pass	
X6	Pass	
X7	Pass	
X8	Pass	
X9	Pass	
X10	Pass	
X11	Pass	
X12	Pass	
X13	Pass	
X14	N	

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Ⅶ. PROCEDURE PHOTO



Ⅷ. TEST APPARATUS

AGC-BT-E015	Vacuum chamber	AGC-RE-E038	Temperature circulation chamber
AGC-RE-E062	Impact test instrument	AGC-RE-E015	Vibration test instrument
AGC-BT-E009	Battery short circuit testing instrument	AGC-BT-E010	Battery short circuit temperature instrument
AGC-BT-E011	Battery extrusion test instrument	AGC-SA-E019	DC power supply
AGC-BT-E001	Battery test system	AGC-SA-E093	Digital multimeter
AGC-SA-E018	Temperature recorder	AGC-SA-E075	Electronic balance
AGC-SA-E016	DC electronic load		

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