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UN Test Report

- ASM P/N 45N1028 (Nom. 94Wh, 11.1V)-

목 차

2011. 10. 13

LG Chem
Mobile Energy Division

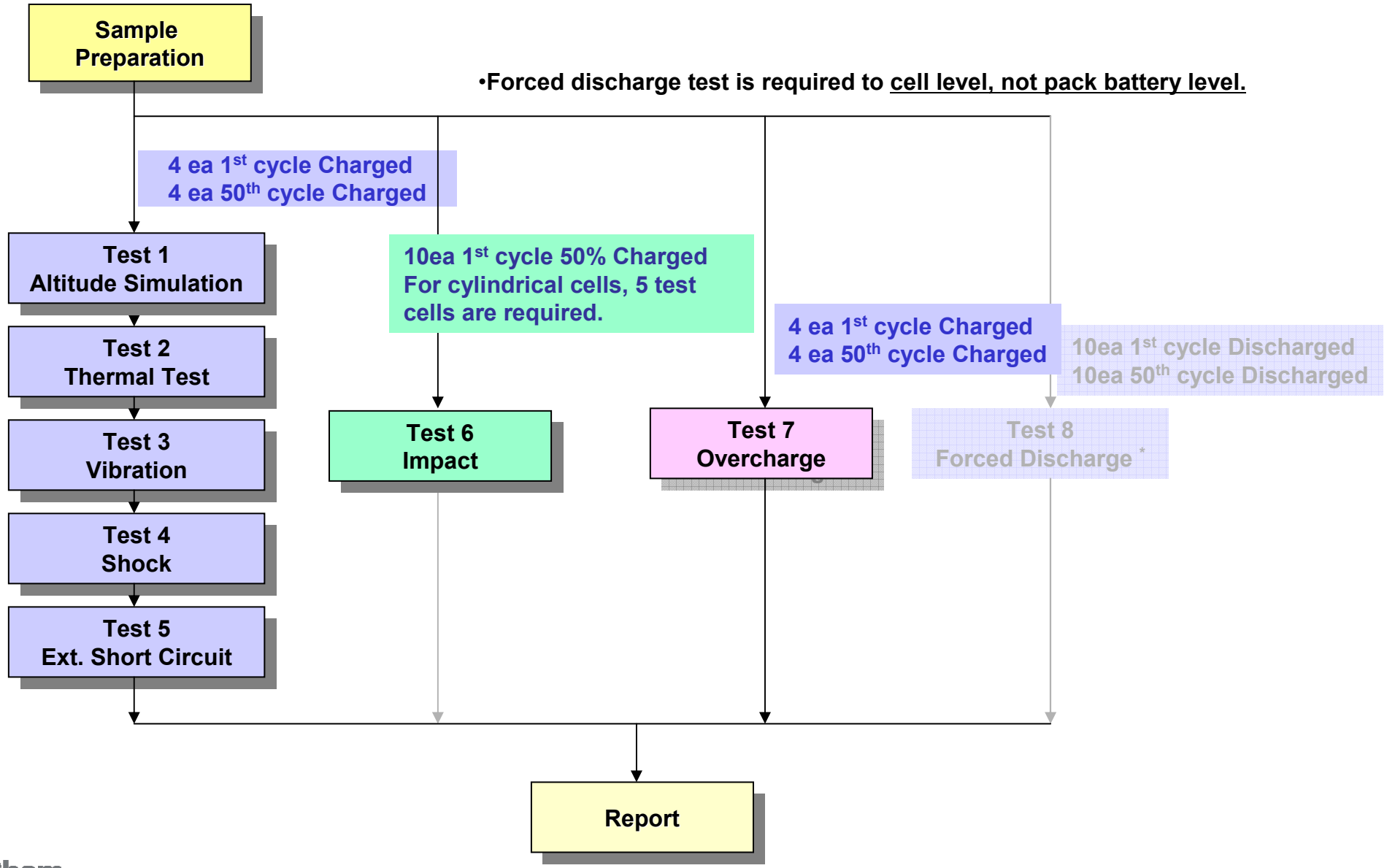
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/ after each test (If M>5g, less than 0.1%) - Measuring voltage before/ after each test (more than 90%) - No leakage, no venting, no disassembly, no rupture, no fire
Test 2. Thermal Test	[75±2℃,6hr ↔ -40±2℃,6hr,interval max. 30min] x 10cycle Storing at 20±5℃ for 24h	
Test 3. Vibration	[7Hz↔200Hz↔7Hz, in 15min] x 12 times x 3 direction 1) sinusoidal waveform with a logarithmic sweep 2) 7Hz 18Hz (maintaining 1gn) app. 50Hz (until 8gn) 200Hz (maintaining 8gn), 1.6mm total excursion	
Test 4. Shock	Half sine shock (peak acceleration : 150gn, pulse duration : 6msec) x 6 (±x, y, z) direction x 3 cycle	
Test 5. External Short Circuit	100mΩ ext. short-circuit at 55±2℃ 1hr continue after returning at 55±2℃	- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170℃)
Test 6. Impact	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	
Test 7. Overcharge	Current = Manufacturer's recommended max. continuous charge current X 2 Voltage 1.If charge voltage ≤ 18V, V (min.) = 2 x (max. charge voltage) or V (min.) = 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	- No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Only for Cell, not battery.	- No disassembly, no fire (after 7 days)

* Tests through T1-T5 shall be conducted in sequence with the same battery.

* We declare that the above-mentioned test is the result of being checked according to UN Test (Manual of Test and Criteria ST/SG/AC.10/11/Rev.5)

2. Test Procedure



3-1. T1-T4 Test Result

Before				Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
	Pack NO.	OCV	Mass	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result
A. 1st cycle fully state																							
Charge	1	12.482	473.829	12.479	473.827	99.98	0.000	Pass	12.477	473.824	99.98	0.001	Pass	12.475	473.810	99.98	0.003	Pass	12.472	473.798	99.98	0.003	Pass
	2	12.493	474.826	12.490	474.823	99.98	0.001	Pass	12.487	474.820	99.98	0.001	Pass	12.484	474.812	99.98	0.002	Pass	12.482	474.802	99.98	0.002	Pass
	3	12.468	472.493	12.465	472.490	99.98	0.001	Pass	12.463	472.485	99.98	0.001	Pass	12.461	472.479	99.98	0.001	Pass	12.458	472.473	99.98	0.001	Pass
	4	12.475	473.749	12.472	473.743	99.98	0.001	Pass	12.470	473.739	99.98	0.001	Pass	12.467	473.729	99.98	0.002	Pass	12.465	473.717	99.98	0.003	Pass
	Ave.	12.480	473.724	12.477	473.721	99.98	0.001	-	12.474	473.717	99.98	0.001	-	12.472	473.708	99.98	0.002	-	12.469	473.698	99.98	0.002	-
B. 50th cycle fully state																							
Charge	9	12.391	473.854	12.388	473.839	99.98	0.003	Pass	12.281	473.824	99.14	0.003	Pass	12.276	473.813	99.96	0.002	Pass	12.258	473.799	99.85	0.003	Pass
	10	12.399	472.875	12.372	472.866	99.78	0.002	Pass	12.264	472.861	99.13	0.001	Pass	12.261	472.847	99.98	0.003	Pass	12.236	472.841	99.80	0.001	Pass
	11	12.385	473.768	12.378	473.757	99.94	0.002	Pass	12.268	473.748	99.11	0.002	Pass	12.257	473.736	99.91	0.003	Pass	12.239	473.725	99.85	0.002	Pass
	12	12.388	472.670	12.381	472.662	99.94	0.002	Pass	12.265	472.658	99.06	0.001	Pass	12.246	472.646	99.85	0.003	Pass	12.230	472.631	99.87	0.003	Pass
	Ave.	12.391	473.292	12.380	473.281	99.91	0.002	-	12.270	473.273	99.11	0.002	-	12.260	473.261	99.92	0.003	-	12.241	473.249	99.84	0.002	-

Requirement	- Measuring mass before/after each test (If M>5g, less than 0.1%) - Measuring voltage before/after each test (more than 90%, only charged samples) - No leakage, no venting, no disassembly, no rupture, no fire

3-2. T5/T7 Test Result

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully state				
Charge	1	12.472	55.77	Pass
	2	12.482	55.02	Pass
	3	12.458	54.96	Pass
	4	12.465	55.68	Pass
	MAX.	12.482	55.77	-

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	5	12.258	55.68	Pass
	6	12.236	55.17	Pass
	7	12.239	55.21	Pass
	8	12.230	55.38	Pass
	MAX.	12.258	55.68	-

Test Condition
- 100mΩ ext. short-circuit at 55±2℃

Requirement
- Temperature < 170 (℃) - No disassembly, no rupture, no fire within 6 hours

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully state				
Charge	9	12.419	25.01	Pass
	10	12.429	25.09	Pass
	11	12.449	24.82	Pass
	12	12.429	25.83	Pass
	MAX.	12.449	25.83	-

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	13	12.372	25.23	Pass
	14	12.392	25.39	Pass
	15	12.383	25.62	Pass
	16	12.372	24.87	Pass
	MAX.	12.392	25.62	-

Test Condition
- Max. Charge Current : 4000 mA - CC/CV 2Imax(8000mA) 22V cut-off 24Hr

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICR18650C2)

Impact (T6)			
Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charge state			
21	3.807	25.43	**Pass**
22	3.807	108.50	**Pass**
23	3.806	24.36	**Pass**
24	3.806	24.79	**Pass**
25	3.806	114.39	**Pass**
MAX.	3.807	114.39	-
B. 50th cycle fully discharge state			
26	3.351	24.83	**Pass**
27	3.362	46.43	**Pass**
28	3.387	49.26	**Pass**
29	3.369	49.90	**Pass**
30	3.353	47.55	**Pass**
MAX.	3.387	49.90	-

Test Condition
- Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height

Requirement
- Temperature < 170 (℃) - No disassembly, no rupture, no fire within 6 hours

4. Sample Image