LG Chem, Ltd.
128, Yeoui-daero, Yeongdeungpo-gu,
Seoul, Korea

Certification & Evaluation Team
Tel: 82-42-870-6195, Fax: 82-42-863-0182
If any of pages is not legible or has not been received,
please notify our office for re-transmission

CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5th revised edition Amendment 2 of the UN Manual of Tests and Criteria.

We, LG Chem. Ltd hereby certify that this cell meets the requirements of the regulation for transportation of lithium-ion cells and batteries.

☑ Lithium-ion cell ☐ Lithium-ion battery ☐ Lithium-ion single cell battery	
Model name	**ICR18650MJ1, INR18650MJ1**
Capacity	**Nom. 3500mAh**
Nominal voltage	**3.635 V**
Type of Cell	**Cylindrical**

Conducted By: Dae Ho Nam

Manager
Certification & Evaluation
LG Chem, Ltd.
E-mail: kkammy@lgchem.com

Reviewed By: Byung Soo Kim

General Manager
Certification & Evaluation
LG Chem, Ltd.
E-mail: bskim@lgchem.com

문서번호	QAE-EF02-150313-CY18650MJ1	
Prepared	남익현	
	장승현	
Reviewed	남대호	
	이재승	
Approved	김병수	

SolutionPartner

UN Test Report
- ICR18650MJ1, INR18650MJ1 (Nom. 3500 mAh)-

목 차

2015. 03. 13

LG Chem

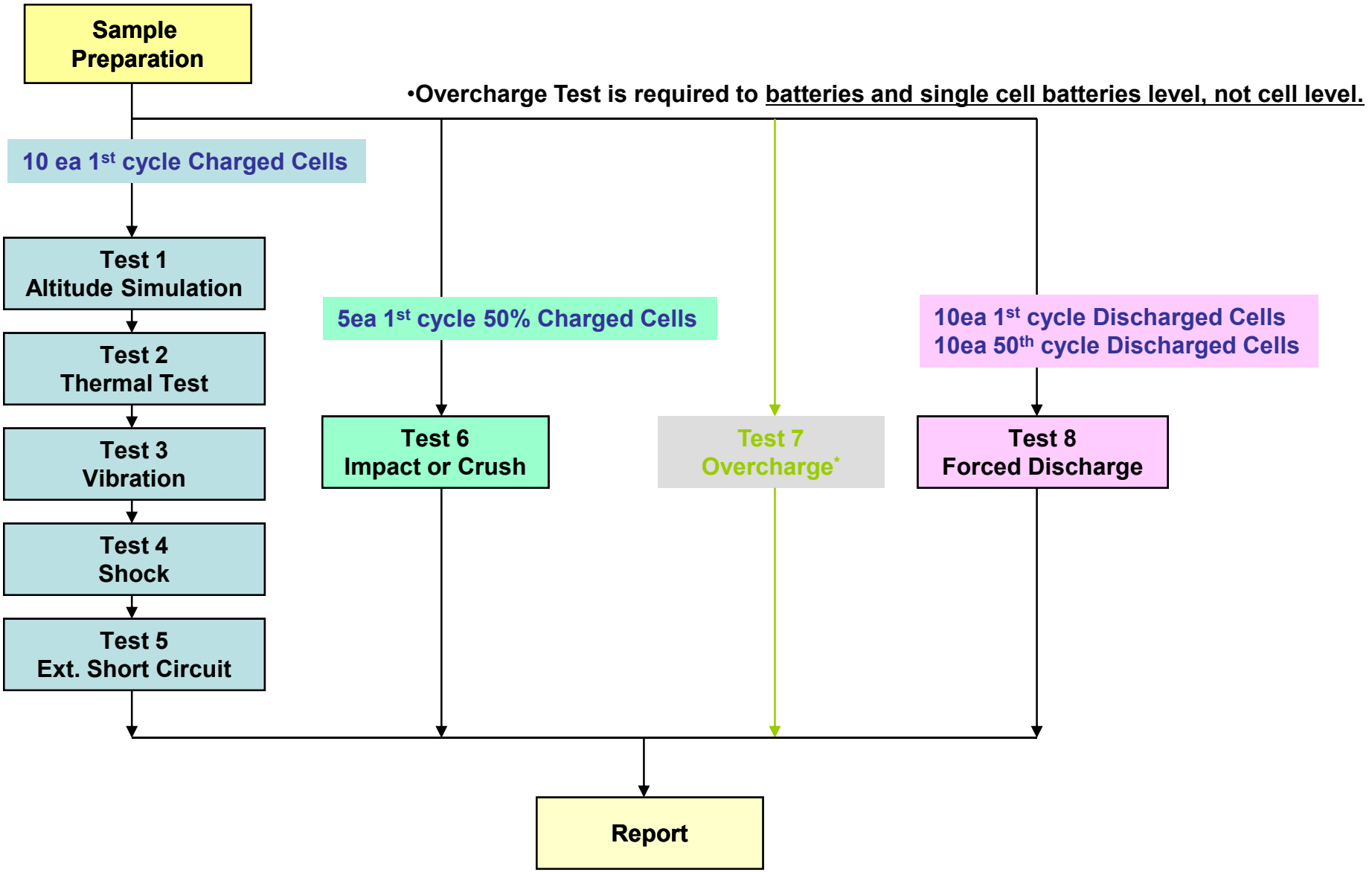
1. UN Transportation Regulation Test

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<1g, less than 0.5%, If 1g≤M≤75g, less than 0.2%, If M>75g, 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	[72±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 within 6 hours after the test - Temp. monitoring (max. 170℃)
Test 6. Impact for cylindrical cells (> 18mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	- No disassembly, no fire within 6 hours after the test - Temp. monitoring (max. 170℃)
Test 6. Crush for cylindrical cells (≤ 18mm diameter) for prismatic, pouch, coin/button cells	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation	
Test 7. Overcharge	Only for battery, not cell.	- Overcharge Test is required to pack battery level, not cell level.
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	- No disassembly, no fire within 7 days after the test

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

* 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/Amd.2)

2. Test Procedure



3-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
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 charged state																						
1	4.192	46.661	4.190	46.661	99.95	0.000	**Pass**	4.121	46.650	98.35	0.024	**Pass**	4.120	46.647	99.98	0.006	**Pass**	4.120	46.647	100.00	0.000	**Pass**
2	4.193	46.498	4.190	46.497	99.93	0.002	**Pass**	4.121	46.488	98.35	0.019	**Pass**	4.121	46.486	100.00	0.004	**Pass**	4.120	46.486	99.98	0.000	**Pass**
3	4.193	46.593	4.193	46.592	100.00	0.002	**Pass**	4.121	46.581	98.28	0.024	**Pass**	4.121	46.578	100.00	0.006	**Pass**	4.121	46.578	100.00	0.000	**Pass**
4	4.193	46.741	4.190	46.740	99.93	0.002	**Pass**	4.121	46.732	98.35	0.017	**Pass**	4.120	46.730	99.98	0.004	**Pass**	4.120	46.730	100.00	0.000	**Pass**
5	4.193	46.744	4.190	46.743	99.93	0.002	**Pass**	4.121	46.734	98.35	0.019	**Pass**	4.121	46.732	100.00	0.004	**Pass**	4.120	46.732	99.98	0.000	**Pass**
6	4.193	46.527	4.190	46.527	99.93	0.000	**Pass**	4.120	46.515	98.33	0.026	**Pass**	4.120	46.513	100.00	0.004	**Pass**	4.119	46.513	99.98	0.000	**Pass**
7	4.193	46.560	4.190	46.559	99.93	0.002	**Pass**	4.119	46.550	98.31	0.019	**Pass**	4.119	46.550	100.00	0.000	**Pass**	4.119	46.550	100.00	0.000	**Pass**
8	4.192	46.811	4.190	46.811	99.95	0.000	**Pass**	4.121	46.799	98.35	0.026	**Pass**	4.121	46.797	100.00	0.004	**Pass**	4.121	46.797	100.00	0.000	**Pass**
9	4.192	46.550	4.190	46.548	99.95	0.004	**Pass**	4.120	46.539	98.33	0.019	**Pass**	4.119	46.534	99.98	0.011	**Pass**	4.119	46.534	100.00	0.000	**Pass**
10	4.192	46.552	4.190	46.552	99.95	0.000	**Pass**	4.120	46.543	98.33	0.019	**Pass**	4.119	46.540	99.98	0.006	**Pass**	4.119	46.540	100.00	0.000	**Pass**
Ave.	4.193	46.624	4.190	46.623	99.95	0.002	-	4.121	46.613	98.33	0.021	-	4.120	46.611	99.99	0.005	-	4.120	46.611	99.99	0.000	-

Requirement	- Measuring mass before/after each test (If M>75g, less than 0.1%, 1g≤M≤75, less than 0.2%, M<1g, less than 0.5%) - 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/T6/T8 Test Result

EXT.Short Circuit (T5)

NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
1	4.120	94.24	Pass
2	4.120	99.14	Pass
3	4.121	107.09	Pass
4	4.120	91.88	Pass
5	4.120	106.93	Pass
6	4.119	97.77	Pass
7	4.119	88.29	Pass
8	4.121	96.45	Pass
9	4.119	93.29	Pass
10	4.119	95.03	Pass
MAX.	4.121	107.09	-

Test Condition

- 100mΩ ext. short-circuit at 55±2℃

Requirement

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

Impact (T6)

Direction	NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charged state				
Flat	11	3.573	111.58	Pass
	12	3.574	22.72	Pass
	13	3.571	103.07	Pass
	14	3.572	118.75	Pass
	15	3.504	23.40	Pass
MAX.		3.574	118.75	-

Test Condition

- Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation

Requirement

- Temperature ≤ 170 (℃)
- No disassembly, no fire within 6 hours after the test

Forced Discharge (T8)

NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully Discharged state			
16	3.120	101.98	Pass
17	3.122	113.68	Pass
18	3.127	114.90	Pass
19	3.133	100.89	Pass
20	3.104	110.99	Pass
21	3.126	112.91	Pass
22	3.129	84.53	Pass
23	3.133	112.68	Pass
24	3.122	109.24	Pass
25	3.122	112.60	Pass
MAX.	3.133	114.90	-
B. 50th cycle fully discharged state			
26	3.148	100.99	Pass
27	3.141	129.67	Pass
28	3.150	118.20	Pass
29	3.150	122.12	Pass
30	3.145	112.35	Pass
31	3.143	107.39	Pass
32	3.149	103.83	Pass
33	3.146	116.53	Pass
34	3.142	121.45	Pass
35	3.147	120.54	Pass
MAX.	3.150	129.67	-

Test Condition

- Discharge at max. discharge current (with 12V DC power supply) : 10000mA
  Duration time: rated capacity (21min)

Requirement

- No disassembly, no fire within 7 days after the test

4. Sample Image

Appendix 1. 1.2m Drop Test Report

A. Test Result

No	Name of Test Items	Standard requirement or The Clause Number of Standard	Test Result		Conclusion
1	**1.2m Drop Test**	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18th) special provisions 188	Face	The package is not cracked, the contents are not damaged and not shifted.	**PASS**
			Edge	The package is not cracked, the contents are not damaged and not shifted.	
			Angle	The package is not cracked, the contents are not damaged and not shifted.	
2	**Gross Weight Measure**	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18th) special provisions 188	676.2g		**PASS**

B. Sample Description

Dimensions	24.4×12.8×9.3cm	**Net Weight of Batteries**	375.2g	**Battery Type**	Rechargeable Li-ion Battery
Gross weight	676.2g	**Battery number**	8Pcs/Carton	**** Description**	Covered by air bag

C. Image After Test

* Recommendations on the transport of dangerous goods as below
Each package of cells or batteries, or the completed package must be capable of withstanding a 1.2 m drop test in any orientation without:
1) damage to cells or batteries contained therein
2) shifting of the contents so as to allow battery to battery (or cell to cell) contact
3) release of contents.
** Description: Description about the protection of short-circuit