UN Test Report
- ASM P/N 42T4802 (Nom. 94Wh, 11.1V) -

목 차

1. UN Transportation Regulation Test
2. Test Procedure
3. Test Result
4. Sample Image

2009. 08. 28

LG Chem
Mobile Energy Division
# 1. UN Transportation Regulation Test

<table>
<thead>
<tr>
<th>Test</th>
<th>Condition</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1. Altitude Simulation</td>
<td>Storing at (low pressure) 11.6kPa for 6hr at 20±5°C</td>
<td></td>
</tr>
<tr>
<td>Test 2. Thermal Test</td>
<td>[75±2°C, 6hr ↔ -40±2°C, 6hr, interval max. 30min] x 10cycle Storing at 20±5°C for 24h</td>
<td>- Measuring mass before/after each test (If M&gt;5g, less than 0.1%)</td>
</tr>
<tr>
<td>Test 3. Vibration</td>
<td>[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</td>
<td>- Measuring voltage before/after each test (more than 90%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- No leakage, no venting, no disassembly, no rupture, no fire</td>
</tr>
<tr>
<td>Test 4. Shock</td>
<td>Half sine shock (peak acceleration : 150gn, pulse duration : 6msec) x 6 (x, y, z) direction x 3 cycle</td>
<td></td>
</tr>
<tr>
<td>Test 5. External Short Circuit</td>
<td>100mΩ ext. short-circuit at 55±2°C 1hr continue after returning at 55±2°C</td>
<td>- No disassembly, no rupture, no fire (after 6 hours)</td>
</tr>
<tr>
<td>Test 6. Impact</td>
<td>Only for Cell, not battery.</td>
<td>- Temp. monitoring (max. 170°C)</td>
</tr>
<tr>
<td>Test 7. Overcharge</td>
<td>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 &gt; 18V, V (min.) = 1.2 x (max. charge voltage)</td>
<td>- No disassembly, no fire (after 7 days)</td>
</tr>
<tr>
<td>Test 8. Forced Discharge</td>
<td>Only for Cell, not battery.</td>
<td>- No disassembly, no fire (after 7 days)</td>
</tr>
</tbody>
</table>

* 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.10/27/Add.2)
2. Test Procedure

Sample Preparation

4 ea 1\textsuperscript{st} cycle Charged
4 ea 1\textsuperscript{st} cycle Discharged
4 ea 50\textsuperscript{th} cycle Charged
4 ea 50\textsuperscript{th} cycle Discharged

Test 1
Altitude Simulation

Test 2
Thermal Test

Test 3
Vibration

Test 4
Shock

Test 5
Ext. Short Circuit

Test 6
Impact

Test 7
Overcharge

Report

Test 8
Forced Discharge

• Impact & Forced discharge test is required to cell level, not pack battery level.

For cylindrical cells, 5 test cells are required.
3-1. T1-T4 Test Result

### A. 1st cycle fully state

<table>
<thead>
<tr>
<th>Pack NO.</th>
<th>Altitude (T1)</th>
<th>Thermal (T2)</th>
<th>Vibration (T3)</th>
<th>Shock (T4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OCV</td>
<td>Mass</td>
<td>OCV</td>
<td>Mass</td>
</tr>
<tr>
<td>1</td>
<td>12.355</td>
<td>482.10</td>
<td>12.350</td>
<td>482.10</td>
</tr>
<tr>
<td>2</td>
<td>12.347</td>
<td>480.73</td>
<td>12.345</td>
<td>480.73</td>
</tr>
<tr>
<td>3</td>
<td>12.374</td>
<td>480.00</td>
<td>12.370</td>
<td>480.50</td>
</tr>
<tr>
<td>4</td>
<td>12.384</td>
<td>481.04</td>
<td>12.380</td>
<td>481.04</td>
</tr>
<tr>
<td>Ave.</td>
<td>12.365</td>
<td>481.09</td>
<td>12.361</td>
<td>481.09</td>
</tr>
</tbody>
</table>

### B. 50th cycle fully state

<table>
<thead>
<tr>
<th>Pack NO.</th>
<th>Altitude (T1)</th>
<th>Thermal (T2)</th>
<th>Vibration (T3)</th>
<th>Shock (T4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OCV</td>
<td>Mass</td>
<td>OCV</td>
<td>Mass</td>
</tr>
<tr>
<td>9</td>
<td>12.380</td>
<td>481.98</td>
<td>12.374</td>
<td>481.98</td>
</tr>
<tr>
<td>10</td>
<td>12.380</td>
<td>482.96</td>
<td>12.375</td>
<td>482.96</td>
</tr>
<tr>
<td>11</td>
<td>12.347</td>
<td>482.68</td>
<td>12.343</td>
<td>482.68</td>
</tr>
<tr>
<td>12</td>
<td>12.352</td>
<td>481.66</td>
<td>12.348</td>
<td>481.66</td>
</tr>
<tr>
<td>Ave.</td>
<td>12.365</td>
<td>482.32</td>
<td>12.360</td>
<td>482.32</td>
</tr>
</tbody>
</table>

### 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)

<table>
<thead>
<tr>
<th>Pack NO.</th>
<th>Initial OCV(V)</th>
<th>Max. Temp (℃)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 1st cycle fully state</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>12.116</td>
<td>56.08</td>
<td>Pass</td>
</tr>
<tr>
<td>2</td>
<td>12.107</td>
<td>55.54</td>
<td>Pass</td>
</tr>
<tr>
<td>3</td>
<td>12.124</td>
<td>55.48</td>
<td>Pass</td>
</tr>
<tr>
<td>4</td>
<td>12.150</td>
<td>56.29</td>
<td>Pass</td>
</tr>
<tr>
<td>MAX.</td>
<td>12.150</td>
<td>56.29</td>
<td>-</td>
</tr>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10.423</td>
<td>56.08</td>
<td>Pass</td>
</tr>
<tr>
<td>6</td>
<td>10.413</td>
<td>55.23</td>
<td>Pass</td>
</tr>
<tr>
<td>7</td>
<td>10.435</td>
<td>56.04</td>
<td>Pass</td>
</tr>
<tr>
<td>8</td>
<td>10.431</td>
<td>56.18</td>
<td>Pass</td>
</tr>
<tr>
<td>MAX.</td>
<td>10.435</td>
<td>56.18</td>
<td>-</td>
</tr>
</tbody>
</table>

#### EXT.Short Circuit (T5)

<table>
<thead>
<tr>
<th>Pack NO.</th>
<th>Initial OCV(V)</th>
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<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. 50th cycle fully state</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>12.131</td>
<td>56.26</td>
<td>Pass</td>
</tr>
<tr>
<td>10</td>
<td>12.130</td>
<td>55.51</td>
<td>Pass</td>
</tr>
<tr>
<td>11</td>
<td>12.114</td>
<td>55.90</td>
<td>Pass</td>
</tr>
<tr>
<td>12</td>
<td>12.115</td>
<td>56.45</td>
<td>Pass</td>
</tr>
<tr>
<td>MAX.</td>
<td>12.131</td>
<td>56.45</td>
<td>-</td>
</tr>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>10.454</td>
<td>56.09</td>
<td>Pass</td>
</tr>
<tr>
<td>14</td>
<td>10.467</td>
<td>55.47</td>
<td>Pass</td>
</tr>
<tr>
<td>15</td>
<td>10.419</td>
<td>55.84</td>
<td>Pass</td>
</tr>
<tr>
<td>16</td>
<td>10.485</td>
<td>56.26</td>
<td>Pass</td>
</tr>
<tr>
<td>MAX.</td>
<td>10.485</td>
<td>56.26</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Test Condition

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

#### Over Charge (T7)

<table>
<thead>
<tr>
<th>Pack NO.</th>
<th>Initial OCV(V)</th>
<th>Max. Temp (℃)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 1st cycle fully state</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>12.356</td>
<td>26.51</td>
<td>Pass</td>
</tr>
<tr>
<td>18</td>
<td>12.591</td>
<td>26.16</td>
<td>Pass</td>
</tr>
<tr>
<td>19</td>
<td>12.329</td>
<td>26.48</td>
<td>Pass</td>
</tr>
<tr>
<td>20</td>
<td>12.357</td>
<td>26.86</td>
<td>Pass</td>
</tr>
<tr>
<td>MAX.</td>
<td>12.591</td>
<td>26.86</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Over Charge (T7)

<table>
<thead>
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<th>Initial OCV(V)</th>
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<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. 50th cycle fully state</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>12.354</td>
<td>22.04</td>
<td>Pass</td>
</tr>
<tr>
<td>22</td>
<td>12.355</td>
<td>22.71</td>
<td>Pass</td>
</tr>
<tr>
<td>23</td>
<td>12.329</td>
<td>21.64</td>
<td>Pass</td>
</tr>
<tr>
<td>24</td>
<td>12.365</td>
<td>22.48</td>
<td>Pass</td>
</tr>
<tr>
<td>MAX.</td>
<td>12.356</td>
<td>22.71</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Test Condition

- Max. Charge Current : 4100mA
- CC/CV 2Imax(8200mA) 22V cut-off 24Hr

#### Requirement

- No disassembly, no fire within 7 day
4. Sample Image