GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 13. 300
C 66

GB 19521.11-2005

Safety Code for Inspection of Hazardous Properties for Dangerous Goods of Lithium Batteries

锂电池组危险货物危险特性检验安全规范

Issued on: October 19, 2005 **Implemented on: May 01, 2006**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China;

Standardization Administration of the People's Republic of China.

Table of Contents

Safety Code for Inspection of Hazardous Properties for Dangerous Goods of Lithium Batteries

1 Scope

This standard specifies the requirements, tests and inspection rules for dangerous goods of lithium-ion cells or batteries.

This standard is applicable to the inspection of hazardous properties for dangerous goods of lithium-ion cells or batteries.

2 Normative References

The following documents contain provisions which, through reference in this text, constitute provisions of this standard. For dated reference, subsequent amendments to (excluding correction to), or revisions of, any of these publications do not apply. However, the parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. For undated references, the latest edition of the normative document referred to applies.

GB 19458 "Safety Code for Inspection of Hazardous Properties for Dangerous Goods-General Specifications"

IEC 60050 (482) "International Electrotechnical Vocabulary - Part 482: Primary and Secondary Cells and Batteries"

"UN Recommendations on the Transport of Dangerous Goods--Model Regulation" (Thirteenth revised edition)

"UN Recommendations on the Transport of Dangerous Goods--Manual of Tests and Criteria" (Fourth revised edition)

3 Terms and Definitions

The terms and definitions established in the "UN Recommendations on the Transport of Dangerous Goods--Manual of Tests and Criteria" (Fourth revised edition) and in IEC 60050 (482) as well as the following ones are applicable to this standard.

Protective device

It refers to the device that cuts off the current flowing, prevents the current from flowing to one direction or restricting the current from flowing in one circuit, for instance, fuse, diode and current limiter.

3.14

Rated capacity

It refers to the electric capacity of cell or battery measured after it withstands the load, temperature and voltage cut-off points given by the manufacturer; the unit is A·h.

3.15

Short circuit

It refers to the direct connection between the anode and cathode of cell or battery to provide an almost resistance-free path for current.

3.16

Small battery

It refers to the battery that is composed of small cells and for which the aggregate lithium content at the anodes of all the cells therein is not larger than 500g at the fully charged state.

3.17

Small cell

It refers the cell for which the content of lithium at its anode is not larger than 12g at the fully charged state.

4 Requirements

4.1 General Requirements

4.1.1 The marks, signs and dangerous goods colored labels incused, printed or pasted on the package of dangerous goods of lithium batteries shall be accurate and clear, and shall meet the requirements of the relevant provisions specified in GB 19458.

4.1.2 Each lithium cell and battery shall be equipped with safe air exhausting device, or

5.2.3 Test methods

5.2.3.1 Vibration

The cell and battery shall be clipped onto the platform of vibration machine fixedly and tightly without any surface deformed. The simple harmonic vibration with amplitude of 0.8mm (total drift: 1.6mm) shall be applied. The frequency shall be varied according to 1 HZ/min between 10HZ and 55HZ. Three mutually perpendicular cells or batteries shall be applied with the full back-and-forth vibration frequency range in their installation orientations, and the time required for each direction shall be 95min±5min. If the cells or batteries have only two symmetry axes, then the test shall be carried out in the direction perpendicular to each symmetry axis, and one vibration direction therein shall be perpendicular to the electrode surface.

5.2.3.2 Impact

The cell and battery shall be tightened onto the impact testing apparatus with hard bracket, and the bracket shall support all the installation surfaces. Each cell or battery shall bear impacts of the equal size for three times, and these impacts shall be applied along three mutually perpendicular directions that are orthometric to the cell or battery surface. During the impact of every time, the acceleration mode of cell or battery shall be:

a) As for the small cell and small battery, the minimum mean acceleration within the first 3ms shall be 75 times of the local gravity acceleration, and the maximum acceleration shall be 125~175 times of the local gravity acceleration; or

b) As for the large cell and large battery, the maximum acceleration not less than 50 times of the local gravity acceleration shall be reached within at most 11ms.

5.2.3.3 Short circuit

The same as 5.1.3.3.

5.3 Vibration, Impact and Charge Test

5.3.1 Test equipments

This test needs the following equipments: vibration machine, impact testing apparatus, resistor and voltmeter. The impact testing apparatus shall meet the requirements stated in 38.3.4.2.2.1 of the "UN Recommendations on the Transport of Dangerous Goods--Manual of Tests and Criteria" (Fourth revised edition).

5.3.2 Specimen preparation

The test specimens shall be prepared according to the requirements stated in 38.3.4.3.2 of the "UN Recommendations on the Transport of Dangerous Goods--Manual of Tests and Criteria" (Fourth revised edition).

5.3.3 Test methods

5.3.3.1 Vibration

The same as 5.2.3.1.

5.3.3.2 Impact

The same as 5.2.3.2.

5.3.3.3 Charge test

One test cell or battery shall be connected with one non-discharged primary cell or battery of the same type or one fully charged rechargeable cell or battery in the series connected cell string, and the electrodes of the test cell or battery shall be inversely connected. As for the cell with nominal voltage less than 2V and the battery for which the nominal voltage of all the cells constituting it is less than 2V, the total number of the cells or batteries in the series connected cell string, including the test cells or batteries, shall be equal to "18V/V" and shall be rounded off to the proximate integral number, here V is the nominal voltage of one cell or battery. As for the cell with nominal voltage equal to or larger than 2V and the battery for which the nominal voltage of all the cells constituting it is equal to or larger than 2V, the total number of the cells or batteries in the series connected cell string, including the test cells or batteries, shall be equal to "12V/V" and shall be rounded off to the proximate integral number, here V is the nominal voltage of one cell or battery. One resistive load shall be added into the series connected cells or batteries. If the cell or battery has no protective device, the resistive load shall be able to make the mean current consumption be equal to the maximum continuous discharge current given by the manufacturer. Where the large cell can not obtain this mean current consumption by using this test procedure, the required current consumption shall be the maximum current that is able to be obtained according to this test procedure at the ambient temperature of the test. If the cell or battery contains one or more protective devices, then the resistive load shall be a little larger than (not exceeding 10%) the maximum resistive load at which one protective device therein may be started during the process of charge test. The test cell or battery shall be charged by connecting the circuit. Staring from the connecting of circuit, the test shall be carried out till the voltage of the series connected cell string reaches 10% of its initial open-circuit voltage or be carried out for 24h, whichever is longer.

5.4 Internal Short Circuit Test

5.4.1 Test equipments

The same as 5.2.3.2.

5.5.3.3 Low-capacity cell

The battery shall be discharged under the condition of one resistive load is set. If the protective devices are set, then the resistive load shall be a little larger than (not exceeding 10%) the maximum resistive load at which one protective device therein may be started during the process of forced discharge test. If no protective device is set, as for the battery assembled with such cells that all are not discharged or not charged and discharged alternately, the resistive load shall make the mean energy consumption be equal to the maximum discharge quantity given by the manufacturer. Where the large cell can not obtain this mean current consumption by using this test procedure, the required current consumption shall be the maximum current that is able to be obtained according to this test procedure at the ambient temperature of the test. The discharge shall be stopped when the pole voltage of battery is equal to or less than 10% of the initial open-circuit voltage. The battery shall be observed for 24h after the resistive load is removed.

5.6 Forced Discharge Test

5.6.1 Test equipments

Resistor and voltmeter.

5.6.2 Specimen preparation

The test specimens shall be prepared according to the requirements stated in 38.3.4.6.2 of the "UN Recommendations on the Transport of Dangerous Goods--Manual of Tests and Criteria" (Fourth revised edition).

5.6.3 Test methods

Every cell and battery must be carried out with the following test procedures. One test cell or battery shall be connected with one non-discharged primary cell or battery of the same type or one fully charged rechargeable cell or battery in the series connected cell string. As for the cell with nominal voltage less than 2V and the battery for which the nominal voltage of all the cells constituting it is less than 2V, the total number of the cells or batteries in the series connected cell string, including the test cells or batteries, shall be equal to "18V/V" and shall be rounded off to the proximate integral number, here V is the nominal voltage of one cell or battery. As for the cell with nominal voltage equal to or larger than 2V and the battery for which the nominal voltage of all the cells constituting it is equal to or larger than 2V, the total number of the cells or batteries in the series connected cell string, including the test cells or batteries, shall be equal to "12V/V" and shall be rounded off to the proximate integral number, here V is the nominal voltage of one cell or battery. One resistive load shall be added into the series connected cells or batteries. If the cell or battery has no protective device, then this

resistive load shall be able to make the mean current consumption be equal to the maximum discharge current given by the manufacturer; where the large cell can not obtain this mean current consumption by using this test procedure, then the required current consumption shall be the maximum current that is able to be obtained at the ambient temperature of test. If the cell or battery is equipped with protective devices, then the resistive load shall be a little larger than (not exceeding 10%) the maximum resistive load at which one protective device therein may be started during the process of forced discharge test. The test cell or battery shall be discharged by connecting the circuit. Staring from the connecting of circuit, the test shall be carried out till the voltage of the series connected cell string reaches 10% of its initial open-circuit voltage or be carried out for 24h, whichever is longer.

5.7 Classification

The lithium cell and battery shall be respectively carried out with the series tests required in 5.1~5.6, and the tests of every series shall be carried out in order. If the lithium cell or the battery meets all the test requirements listed in Table 1, then this lithium cell or battery shall be judged as the Class 9 dangerous goods. The lithium cells and batteries related to transportation as stated in the Special Regulations 188 in Chapter 3 of "UN Recommendations on the Transport of Dangerous Goods--Model Regulation" (Thirteenth revised edition) are not applicable to this standard.

6 Inspection Rules

6.1 The inspection shall be carried out item by item according to the requirements in Chapter 4 and Chapter 5 of this standard.

6.2 Inspection conditions of hazardous properties:

The inspection of hazardous properties shall be carried out in case any one of the following conditions is met:

-- when the new product is launched to production, or the old product is transferred to new lines;

-- when the product performance may be impacted by the significant changes in materials or process after the product has been launched to formal production;

-- once every half a year during the regular production;

-- when the production is reinstated after a long shutdown;

-- when the delivery inspection result is significantly different from the previous inspection result of hazardous properties;

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------