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**Nonferrous Metals Industry Standard of the People's Republic of China**

YS/T 582—2013

Replace YS/T 582—2006

**Battery Grade Lithium Carbonate**

电池级碳酸锂

（*English Translation*）

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**Foreword**

SAC/TC243 is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

This standard is drafted in accordance with rules given in the GB/T 1.1—2009 *Directive for standardization —Part1: Structure and drafting of standards.*

This standard replaces the YS/T 582—2006 *Battery grade lithium carbonate*. Compared with YS/T 582—2006, the main changes of this Standard are as follows:

—Some product indexes are adjusted;

—Requirements for magnetic impurity and hazardous material are added;

—Measurement method for moisture is modified.

This standard was proposed and prepared by SAC/TC 243 National Nonferrous Metals Standardization Technical Committee.

The previous edition of this standard are as follows:

—YS/T 582—2006.

**Battery grade lithium carbonate**

**1 Scope**

This standard specifies the requirements, testing methods, inspection, marking, packaging, transportation, storage and quality certificate as well as contract/order content for battery grade lithium carbonate.

This standard is applicable to battery grade lithium carbonate that is manufactured in various methods.

**2 Normative Reference**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 191, Packaging - Pictorial markings for handling of goods

GB/T 6284, Chemical products for industrial use - General method for determination of water content - The loss of mass on drying method

GB/T 6678-2003, General principles for sampling chemical products

GB/T 11064 (all parts), Methods for chemical analysis of lithium carbonate, lithium hydroxide monohydrate and lithium chloride

GB/T 19077.1, Particle size analysis - Laser diffraction methods - Part 1: General principles

IEC 62321, Electrotechnical products - Determination of levels of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

**3.1**

**Magnetic impurity**

The material which can be attracted by ferromagnet directly or indirectly. In this standard, it refers to total content of three elements - iron, zinc and chromium.

**4 Requirements**

**4.1 Chemical composition**

Chemical composition of the product shall confirm to Table 1. If the purchaser has special requirements, hazardous substances shall confirm to Annex II to Directive 2011/65/EU of the European Council.

Table 1 %

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Li2CO3 | Impurity contents, ≤ | | | | | | | | | | | | | |
| Na | Mg | Ca | K | Fe | Zn | Cu | Pb | Si | Al | Mn | Ni | SO | Cl- |
| ≥99.5 | 0.025 | 0.008 | 0.005 | 0.001 | 0.001 | 0.0003 | 0.0003 | 0.0003 | 0.003 | 0.001 | 0.0003 | 0.001 | 0.08 | 0.003 |

**4.2 Magnetic impurities**

Magnetic impurities content of the product shall not be more than 0.0003%.

**4.3 Water content**

Water content in the product shall not be more than 0.25%.

**4.4 Particle size**

*d*10≥1 μm，3 μm≤*d*50≤8 μm，9 μm≤*d*90≤15 μm.

**4.5 Appearance quality**

The product shall be white powder with no visible impurities.

**5 Test Methods**

**5.1** Chemical composition analysis of the product shall be carried out in accordance with GB/T 11064. Determination of hazardous substance shall be carried out in accordance with IEC 62321.

**5.2** Determination of magnetic impurities in the product shall be carried out in accordance with Appendix A.

**5.3** Determination of water content in the product shall be carried out in accordance with GB/T 6284.

**5.4** Determination of particle size in the product shall be carried out accordance with GB/T 19077.1.

**5.5** Appearance quality of the product shall be carried out by visual inspection.

**6 Conformity with this standard**

**6.1 Inspection and acceptance**

**6.1.1** The product shall be inspected by the supplier who shall ensure its quality conforming to this standard and contract/order and the quality certificate should also be offered.

**6.1.2** The purchaser shall inspect the received product according to this standard. If the inspection results are found not in conformity to this standard or quality certificate, the purchaser shall inform the supplier within 3 months from the date of receiving the product, and solve the problem through negotiation by both parties. If arbitration is needed, sampling shall be carried out at the purchaser's site.

**6.2 Lots**

The product shall be delivered for inspection and acceptance in lots. Each lot shall consist of same mixture. Net weight of each lot shall be 2t-10t.

**6.3 Inspection items and sampling**

Inspection items and sample numbers shall be as specified in Table 2.

Table 2

|  |  |  |  |
| --- | --- | --- | --- |
| Inspection items | Sampling requirements | Chapter number for the requirements | Chapter number for the test method |
| Chemical composition | As specified under 7.6 of GB/T 6678—2003, stainless steel or UPVC sampler shall be used by inserting sampling tube to 2/3 in the center of the bag; the samples obtained are mixed evenly and quartered to about 200 g. | 4.1 | 5.1 |
| Magnetic impurity | 4.2 | 5.2 |
| Water content | 4.3 | 5.3 |
| Particle size | 4.4 | 5.4 |
| Appearance quality | 4.5 | 5.5 |

**6.4 Determination of inspection results**

**6.4.1** If the result of chemical composition of the product fails the inspection, then double samples shall be taken from the same lot for retesting on unacceptable item; if there is still any inspection result that fails, then this lot is judged as unqualified.

**6.4.2** If appearance quality of the product fails the inspection, then double samples shall be taken from the same lot for retesting; if there is still any inspection result that fails, then this lot is judged as unqualified.

**6.4.3** If magnetic impurities in the product fails the inspection, then double samples shall be taken from the same batch for retesting on unacceptable item; if there is still any inspection result that fails, then this lot is judged as unqualified.

**6.4.4** If water content of the product fails the inspection, then this lot is judged as unqualified.

**6.4.5** If particle size of the product fails the inspection, then this lot is judged as unqualified.

**7 Marking, packaging, transportation, storage and quality certificate**

**7.1 Marking**

Product packing bag shall indicate:

a) Product name;

b) Lot number;

c) Gross weight;

d) Net weight;

e) Main content;

f) Supplier name;

g) Number of this standard;

h) Place of origin;

i)"Keep away from rain" symbol specified in GB/T191.

**7.2 Packaging**

The product is packed in a bag with a plastic inner layer and a plastic woven outer layer (or packed in film coating bag). The top of the inner bag is tied closely or heat sealed while the top of the outer bag knitted firmly. Net weight per bag shall be as required by the purchaser.

**7.3 Transportation**

During transportation, the product shall be kept away from acid; during handling, the packing bag shall not be damaged and the product shall be protected from moisture.

**7.4 Storage**

The product shall be stored in a dry place with no acid corrosion atmosphere.

**7.5 Quality certificate**

Quality certificate shall be attached to each lot of product, which indicates:

a) Supplier name, address, phone and fax numbers;

b) Product name;

c) Reference number of this Standard;

d) Lot number;

e) Release date;

f) Inspection result.

**8 Contract/order contents**

The contract/order contents for the product listed in this standard shall include the following contents:

a) Product name;

b) Quantity;

c) Number of this standard;

d) Other information.

**Annex A**

**(Normative)**

**Determination of magnetic impurities in battery grade lithium carbonate by inductively coupled plasma optical emission spectrometer (ICP-OES)**

**A.1 Method summary**

Magnetic impurities in the specimen are adsorbed by magnetic bar, dissolved by aqua regia and examined by ICP-OES which determines the content of iron, zinc and chromium; total content of the three elements is the content of magnetic impurities.

**A.2 Reagent**

A.2.1 Grade I water

A.2.2 Hydrochloric acid (ρ=1.19 g/mL), GR.

A.2.3 Nitric acid (ρ=l.42 g/mL), GR.

A.2.4 Nitric acid (1 + 1).

A.2.5 Hydrochloric acid (1 + 1).

A.2.6 Aqua regia: mix nitric acid (A.2.3) with hydrochloric acid (A.2.2) as per a volume ratio of 1:3 before use.

A.2.7 Iron standard stock solution, 1mg/mL

Weigh 1.0000 g of iron wire (iron mass fraction ≥9.99%) into a 200 mL beaker, add 20 mL hydrochloric acid (A.2.5), heat the beaker on water bath until the solution is clear. After cooling, transfer to a 1000 mL volumetric flask, dilute to volume with water and mix.

A.2.8 Zinc standard stock solution, 1mg/mL

Weigh 1.0000 g of zinc metal (purity 99.99%) into a 200 mL beaker, add 20 mL hydrochloric acid (A.2.5), heat the beaker under low temperature until the solution is clear. After cooling, transfer to a 1000 mL volumetric flask, dilute to volume with water and mix.

A.2.9 Chromium standard stock solution, 1mg/mL

Weigh 1.0000 g of chromium metal (purity 99.99%) in 200 mL beaker; add 50 mL hydrochloric acid (A.2.5)，heat the beaker under low temperature until the solution is clear. After cooling, transfer to a 1000 mL volumetric flask, dilute to volume with water and mix.

A.2.10 Mixed standard solution A, 100 μg /mL

Transfer 20.00 mL of each standard stock solution (A.2.7~A.2.9) into a 200 mL volumetric flask, add 20 mL nitric acid (A.2.4), dilute to volume with water and mix.

A.2.11 Mixed standard solution B, 10 μg /mL

Transfer 10.00 mL mixed standard solution A (A.2.10) into a 100 mL volumetric flask, add 20 mL nitric acid (A.2.4), dilute to volume with water and mix.

**A.3 Apparatus and materials**

A.3.1 Inductively coupled plasma optical emission spectrometer.

A.3.2 Ultrasonic generator (100 W, 40 kHz).

A.3.3 Magnetic bar (6000 Gs~8500 Gs, Ф30 mmX100mm).

A.3.4 Argon [*φ (*Ar) ≥99.999%].

**A.4 Sample**

Battery grade lithium carbonate

**A.5 Analysis procedure**

A.5.1 Test portion

Weigh out 200 g~250 g sample, accurate to 0.1 g, prepare duplicate samples.

A.5.2 Blank test

Carry out a blank test along with the test portion.

A.5.3 Determination

A.5.3.1 Transfer the test portion (A.5.1) into a 500 mL plastic wide-mouth bottle, place magnetic bar into the bottle and slowly add 250 mL grade I water (A.2.1), put it in electric magnetic stirrer to stir for 30 min at 100 r/min.

A.5.3.2 Take out the magnetic bar; remove lithium on the surface of the magnetic bar with flushing water, put the bar into a 500 mL glass beaker; add 150 mL~200 mL water for ultrasonic cleaning for 2.0 min.

A.5.3.3 Add 15 mL aqua regia (A.2.6) in the glass beaker; place the beaker on heating plate to heat to slight boiling for 20 min; cool to room temperature.

A.5.3.4 Remove the magnetic bar from glass beaker and wash it 3-5 times; transfer the solution into a 250 mL volumetric flask and dilute to volume with water and mix; measure the solution with ICP-OES according to analysis spectral line in Table A.1 in parallel with blank experiment (A.5.2).

Table A.1

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Fe | Cr | Zn |
| Wave length/nm | 259.9 | 267.7 | 213.8 |

A.5.4 Preparation of working curve

A.5.4.1 Add 15 mL prepared aqua regia (A.2.6) in 6 glass beakers respectively, place them on heating plate to heat to slight boiling for 20 min. After being cooled to room temperature, the solution is moved into six 100 mL volumetric flasks; add 0 mL, 0.20 mL, 0.50 mL, l.00 mL, 2.00 mL, 5.00 mL mixed standard solution B (A.2.11) respectively into the flasks, dilute to volume with water and mix. Concentration of each element in standard solution is shown in Table A.2.

Table A.2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Standard series | 1 | 2 | 3 | 4 | 5 |
| Element concentration/ (μg/mL) | 0.020 | 0.050 | 0.100 | 0.200 | 0.500 |

A.5.4.2 Measure standard series solution with ICP-OES according to analysis spectral line in Table A.1. Preparation of working curve with element concentration in standard solution as x-coordinate and emission intensity as y-coordinate.

**A.6 Expression of result**

The mass fraction of each element in the test portion, ωx expressed as a percentage, is given by formula (A.1); total content of iron, zinc and chromium is the content of magnetic impurities:

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Where,

*ρ*1——element concentration in the test solution obtained from working curve, in μg/mL;

*ρ*0——element concentration in blank solution obtained from working curve, in μg/mL;

*V*1——volume of test solution, in mL;

*m*0——sample amount, in g.

**A.7 Permissible deviation**

The difference of analysis results between labs shall not exceed the permissible deviation given in Table A.3.

Table A.3

|  |  |
| --- | --- |
| Mass fraction of magnetic impurities/% | Permissible deviation |
| 0.0002~0.0010 | 0.0001 |

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