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PEOPLE'S REPUBLIC OF CHINA**

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Recycling materials for lithium

再生锂原料

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Table of Contents

1	Scope
2	Normative references
3	Terms and definitions
4	Classification and grades
5	Technical requirements
5.1	Chemical composition
5.2	Appearance quality
6	Test methods
7	Inspection rules
7.1	Inspection and acceptance
7.2	Batching
7.3	Inspection items
7.4	Sampling and sample preparation
7.5	Judgement of inspection results
8	Marking, packaging, transport, storage and accompanying documents
9	Contents of the order
Annex A	(normative) Method of calculating the main content of recycling materials for lithium

1 Scope

This document specifies the classification and grades, technical requirements, test methods, inspection rules, marking, packaging, transport, storage, accompanying documents and contents of the order for recycling materials for lithium.

This document applies to the production and inspection of recycling materials for lithium obtained by processing recovered lithium-ion battery scrap and other lithium-bearing waste.

Note: recycling materials for lithium are divided, according to the anion, into carbonate type, sulfate type, chloride type and phosphate type.

3 Terms and definitions

The following term and definition apply to this document.

3.1 recycling materials for lithium. The directly usable raw material obtained after recovered

lithium-bearing waste has been crushed, sorted, enriched and otherwise processed.

4 Classification and grades

The product is divided into four categories according to the anion; the classification and the grades are given in Table 1.

Table 1 pairs each name with its anion and grade: carbonate type recycling material for lithium, carbonate anion, grade RLi-S1; sulfate type, sulfate anion, grade RLi-S2; chloride type, chloride anion, grade RLi-S3; phosphate type, phosphate anion, grade RLi-S4.

5 Technical requirements

5.1 Chemical composition. The chemical composition of the product shall comply with Table 2. The table fixes a minimum main content by mass fraction for each grade: not less than 80.00 percent of lithium carbonate for RLi-S1, not less than 80.00 percent of lithium sulfate for RLi-S2, not less than 80.00 percent of lithium chloride for RLi-S3 and not less than 85.00 percent of lithium phosphate for RLi-S4. It then caps the impurity elements by mass fraction: lead at not more than 0.05 percent for RLi-S1 and RLi-S4 and not more than 0.01 percent for RLi-S2 and RLi-S3; chromium at not more than 0.01 percent, cadmium at not more than 0.01 percent, arsenic at not more than 0.1 percent and fluorine at not more than 0.5 percent for every grade; and phosphorus at not more than 0.5 percent, with no value given for the phosphate type. Acid-insoluble matter is capped at not more than 0.5 percent. Note: the analysis of the chemical composition is on a dry basis.

5.2 Appearance quality. The product is a white, off-white or grey powder or agglomerate, uniform in colour and with no inclusions visible to the eye.

6 Test methods

The lithium content of the product shall be determined in accordance with YS/T 1593.1 or by a method agreed between supplier and purchaser, and the main content shall be calculated in accordance with Annex A.

The lead, chromium, cadmium, arsenic and phosphorus contents shall be determined in accordance with YS/T 1593.2, and the fluorine content in accordance with YS/T 1593.3.

The acid-insoluble matter shall be determined in accordance with YS/T 1593.6 or by agreement between supplier and purchaser. The appearance quality of the product shall be inspected visually.

7 Inspection rules

7.1 Inspection and acceptance. The product shall be inspected by the supplier or by a third party, and the supplier shall guarantee that the quality of the product complies with this

document and with the order. The purchaser may inspect the product received in accordance with this document; where the result does not agree with this document or with the order, it shall be raised with the supplier within 30 days of receipt of the product and settled by agreement between the two parties. If arbitration is needed, samples shall be taken jointly at the purchaser or as otherwise agreed.

7.2 Batching. The product shall be submitted for inspection in batches, each batch consisting of product of the same category and the same grade. Batches may also be formed according to the incoming batches of the supplier or as agreed between supplier and purchaser.

7.3 Inspection items. Every batch shall be inspected for chemical composition and appearance quality; the inspection items shall comply with Table 3, which links each item to the sampling and sample preparation clause, to the technical requirement clause and to the test method clause.

7.4 Sampling and sample preparation. The number of samples taken from each batch shall follow 7.6 of GB/T 6678-2003, and the quantity taken from each bag shall be not less than 0.2 percent of the weight of the bag. The sub-sample points in each bag shall be spread evenly along any diagonal of the side of the bag, at the top, the middle and the bottom, three points in all; the sampling spear shall be pushed in to two thirds of the depth of the material and shall be filled completely. Where the material is difficult to sample, a hammer may be used to help drive the spear. Each spear sample shall be put promptly into a plastic bag and sealed. All the samples of a batch shall be thoroughly mixed and reduced by quartering with a grid to about 1 kg. The sample shall be dried to constant weight at 105 degrees Celsius $\pm$ 2 degrees Celsius, ground completely and passed through a 0.180 mm standard sieve, then mixed and divided into five portions of not less than 100 g each. The arbitration samples shall be kept separately by supplier and purchaser for six months; where the two parties disagree over the inspection result, the objection shall be raised within the retention period of the arbitration samples.

7.5 Judgement of inspection results. The values of the chemical composition results shall be rounded in accordance with GB/T 8170 and judged by the rounded value comparison method. Where the chemical composition result does not comply with 5.1, double samples shall be taken from the same batch and the failing item re-tested; if any result still fails, the batch is rejected. Where the appearance quality fails, the batch is rejected.

8 Marking, packaging, transport, storage and accompanying documents

8.1 Marking. The outer packing of the product shall carry the product name and grade, the batch number, the net weight, the name of the supplier, the address of the works, and the keep dry and similar marks of GB/T 191.

8.2 Packaging. The product shall be packed in woven bags lined with an aluminium plastic bag or a PE bag and sealed, with a net weight of 200 kg to 500 kg per bag. Packing may also follow the specification the user requires.

8.3 Transport. The product shall be handled with care during loading and unloading so that the packing is not broken, and shall be protected from rain and water during transport.

8.4 Storage. The product shall be stored in a dry, ventilated warehouse free from corrosive goods, and shall not be stored together with acids, alkalis, oils or similar chemicals.

8.5 Accompanying documents. Every batch shall be accompanied by documents which, besides the supplier information, the product information, the number of this document and the date of manufacture or packing, should also include: a) a product quality guarantee giving the main properties and technical parameters of the product, the characteristics of the product including those of the manufacturing process and the raw materials, the responsibility accepted for product quality, and the quality certification obtained together with the analysis and inspection results stamped by the technical supervision department of the supplier; b) a certificate of conformity giving the inspection items and their results or the inspection conclusion, the batch quantity or batch number, the date of manufacture, the date of inspection and the signature or stamp of the inspector; c) the inspection reports of the quality control process and the finished product inspection report; d) instructions for use, covering correct handling, use and storage; e) other items.

9 Contents of the order

The purchaser may, according to its own needs, list the following in the order for the product covered by this document: a) the product name and grade; b) the chemical composition, if there are special requirements; c) the net weight; d) the number of this document; e) other items.

A Annex A (normative) Method of calculating the main content

A.1 The lithium carbonate content is expressed as the mass fraction of lithium carbonate and is calculated from formula (A.1), in which the mass fraction of lithium is multiplied by 5.323, the conversion factor from lithium to lithium carbonate. The result is given to two decimal places and rounded in accordance with GB/T 8170.

A.2 The lithium sulfate content is expressed as the mass fraction of lithium sulfate and is calculated from formula (A.2), in which the mass fraction of lithium is multiplied by 7.920, the conversion factor from lithium to lithium sulfate. The result is given to two decimal places and rounded in accordance with GB/T 8170.

A.3 The lithium chloride content is expressed as the mass fraction of lithium chloride and is calculated from formula (A.3), in which the mass fraction of lithium is multiplied by 6.108, the conversion factor from lithium to lithium chloride. The result is given to two decimal