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Doped Lithium Nickel Cobalt Manganese Oxide

掺杂型镍钴锰酸锂

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Table of Contents

Doped Lithium Nickel Cobalt Manganese Oxide

1 Scope

This Document specifies the designation, technical requirements, test methods, inspection rules, marking, packaging, transportation, storage, accompanying document and ordering list contents of the doped lithium nickel cobalt manganese oxide.

This Document applies to cathode active material of doped lithium nickel cobalt manganese oxide for lithium-ion batteries.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 1717 Determination of pH value of an aqueous suspension of pigments

GB/T 5162 Metallic powders; Determination of tap density

GB/T 5314 Powders for powder metallurgical purposes - Sampling

GB/T 6283 Chemical products - Determination of water Karl Fischer method (general method)

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

GB/T 19077 Particle size analysis - Laser diffraction methods

GB/T 19587 Determination of the specific surface area of solids by gas adsorption using the BET method

GB/T 20252-2014 Lithium cobalt oxide

GB/T 24533-2019 Graphite negative electrode materials for lithium-ion battery

GB/T 37201 Electrochemical performance test of lithium nickel cobalt manganese oxide - Test method for discharge specific capacity and charge-discharge coulombic efficiency

of the first cycle

GB/T 37207 Electrochemical performance test of lithium nickel cobalt manganese oxide - Test method for discharge plateau capacity ratio and cycle life

YS/T 1006.2 Methods for chemical analysis of lithium nickel cobalt manganese oxide – Part 2: Determination of lithium, nickel, cobalt, manganese, sodium, magnesium, aluminum, potassium, copper, calcium, iron, zinc and silicon content – Inductively coupled plasma atomic emission spectrometry

YS/T 1339 Methods for chemical analysis of doped nickel cobalt manganese composite hydroxide – Determination of aluminum, magnesium, titanium, strontium, zirconium, lanthanum and yttrium contents – Inductively coupled plasma atomic emission spectrometry

JCPDS (09-0063) Lithium nickelate X-ray powder diffraction standard pattern

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 20252-2014 apply.

4 Designations

The product uses NCMXYZ(D) to represent the designation, where N represents nickel, C represents cobalt, M represents Mn, X represents the molar fraction of the nickel element, Y represents the molar fraction of the cobalt element; Z represents the molar fraction of manganese element; and D represents the doped type. If the molar fraction is units, then 0 shall be added before the units. If the molar fractions of nickel, cobalt, and manganese are all multipoles of ten, then X, Y, Z are the values of the molar fraction divided by ten.

EXAMPLE 1:

The molar fraction of nickel, cobalt and manganese in the doped lithium nickel cobalt manganese oxide product is 50: 20: 30, and the designation is NCM523(D).

EXAMPLE 2:

The molar fraction of nickel, cobalt and manganese in the doped lithium nickel cobalt manganese oxide product is 65: 15: 20, and the designation is NCM651520(D).

EXAMPLE 3:

The molar fraction of nickel, cobalt and manganese in the doped lithium nickel cobalt manganese oxide product is 88: 9: 3, and the designation is NCM880903(D).

When the discharge capacity of the product reaches 80% of the first discharge capacity under specified conditions, the number of recycling shall be no less than 1000 times.

5.14 Other requirements

If the purchaser has special requirements for doped lithium nickel cobalt manganese oxide, it shall be negotiated between the supplier and the purchaser.

6 Test Methods

6.1 Chemical composition

6.1.1 The content of nickel, cobalt, manganese, lithium, sodium, calcium, iron, zinc and copper in the product shall be determined in accordance with the provisions of YS/T 1006.2.

6.1.2 The content of doping elements in the product shall be measured in accordance with the provisions of YS/T 1339 or the method agreed upon by both the supplier and the purchaser.

6.1.3 The chromium content and sulfur content of the product shall be measured according to the method agreed upon by the supplier and the purchaser.

6.2 Moisture content

The determination of product moisture content shall be carried out in accordance with the provisions of GB/T 6283.

6.3 Magnetic foreign matter

The determination of the magnetic foreign matter content of the product is carried out in accordance with the provisions of Appendix K in GB/T 24533-2019.

6.4 Residual alkali content

The residual alkali content of the product is measured according to the method agreed upon by both the supplier and the purchaser.

6.5 pH value

The pH value of the product is measured in accordance with the provisions of GB/T 1717.

6.6 Appearance quality

The appearance quality of the product is visually inspected.

6.7 Crystal structure

The crystal structure of the product was detected using an X-ray powder diffractometer.

6.8 Tap density

The measurement of product tap density shall be carried out in accordance with the provisions of GB/T 5162.

6.9 Particle size distribution

The determination of product particle size distribution shall be carried out in accordance with the provisions of GB/T 19077.

6.10 Specific surface area

The determination of product specific surface area shall be carried out in accordance with the provisions of GB/T 19587.

6.11 First discharge specific capacity

The first discharge specific capacity of the product is measured in accordance with the provisions of GB/T 37201. The charge and discharge voltage range is in 2.80 V~4.30 V; and other conditions remain unchanged. It can also be carried out according to the method agreed upon by both the supplier and the purchaser.

6.12 First charge and discharge efficiency

The first charge and discharge efficiency of the product is measured in accordance with the provisions of GB/T 37201. The charge and discharge voltage range is in 2.80 V~4.30 V; and other conditions remain unchanged. It can also be carried out according to the method agreed upon by both the supplier and the purchaser.

6.13 Recycling life

The measurement of product recycling life is carried out in accordance with the provisions of GB/T 37207. The charge and discharge voltage range is in 2.80 V~4.30 V; and other conditions remain unchanged. It can also be carried out according to the method agreed upon by both the supplier and the purchaser.

7 Inspection Rules

7.1 Inspection and acceptance

7.1.1 Products shall be inspected by the supplier or a third party to ensure that product quality complies with the provisions of this Document and the order form.

7.1.2 The purchaser may inspect the received products in accordance with the provisions of this Document and the order form. If the inspection results are inconsistent with the provisions of this Document and the order form, it shall be reported to the supplier within 3 months from the

8 Marking, Packaging, Transportation, Storage and Accompanying Documents

8.1 Marking

The product outer packaging mark should be accompanied by the following content:

a) Product name;

b) Batch number;

c) Net weight;

d) Name of supplier;

e) Factory address;

f) "Rainproof" mark.

8.2 Packaging

8.2.1 The product is packed in aluminum-plastic lined bags, sealed and put into outer packaging barrels, with a net weight of 25 kg per barrel.

8.2.2 The product is packed in woven bags lined with aluminum plastic bags and sealed. Each bag has a net weight of 500 kg.

8.2.3 If the purchaser has special requirements for packaging, these shall be determined through negotiation between the purchaser and the supplier.

8.3 Transportation and storage

8.3.1 The packaging of the product shall be avoided from being damaged during transportation.

8.3.2 Products shall be protected from moisture and corrosion during storage. The product has a shelf life of 1 year from the date of production.

8.4 Accompanying files

Each batch of products shall be accompanied by accompanying documents, which shall include, in addition to supplier information, product information, this Document number, exit-factory date or packaging date, the following:

a) Product quality guarantee:

- The main performance and technical parameters of the product;

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