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YS

Nonferrous Metal Industry Standard of the People's Republic of China

YS/T 1008— 20 × ×

Replace YS/T 1008—2014

Coated cobalt powder

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| 包覆钴粉 |
| *(English Translation)* |

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Foreword

SAC/TC 243 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 document is drafted in accordance with the rules given in the GB/T 1.1—2020 *Directive for standardization—Part 1: Rules for structure and drafting of standardization documents.*

This document replaces YS/T 1008—2014 *Coated cobalt powders* in whole. In addition to a number of structural and editorial changes, the following technical deviations have been made with respect to the YS/T 1008—2014.

a) the impurity elements contents of Cu, Fe, Ca, Pb, Zn, Cd, Na, Al, Si and S in product are modified (see Table 1, Table 1 of the 2014 edition);

b) the Co element content requirement of the b product is modified from 99.90% to 99.80% (see Table 1, Table 1 of the 2014 edition);

c) the impurity element content requirement of Cr is added in the chemical compositions (see Table 1);

d) the Fisher number, hydrogen loss, and paraffin content of the product are modified (see Table 2, Table 2 of the 2014 edition);

e) the appearance quality requirement of the product is modified (see 5.3, 3.4 of the 2014 edition);

f) the test method of Cr content is added (see 6.1).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuing body of this document shall not be held responsible for identifying any or all such patent rights.

This document is proposed and prepared by National Technical Committee on Nonferrous Metals of Standardization Administration of China (SAC/TC 243).

The first edition of this document was issued in 2014. This is the first revision edition.

Coated cobalt powders

1 Scope

This document specifies the classification, technical requirements, test methods, inspection rules, marking, packaging, transportation, storage, accompanying documents and order content of coated cobalt powders.

This document is applicable to the coated cobalt powders with paraffin as the forming agent for the cemented carbide industry, and those with polyethylene glycol or polyethylene as the forming agent can be used for reference.

2 Normative references

The following documents contain contents which, through normative referenced in the text, constitute indispensable provisions 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 1479.1 *Metallic powers—Determination of apparent density—Part 1: Funnal method*

GB/T 3249 *Test method for Fisher number of metal powers and related compounds*

GB/T 5158.2 *Metallic powers—Determination of oxygen content by reduction methods—Part 2: Loss of mass on hydrogen reduction (hydrogen loss)*

GB/T 5314 *Powers for power metallurgical purposes—Sampling*

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

YS/T 281 (All parts) *Methods metallurgicalfor chemical analysis of cobalt*

HG/T 4520 *Industrial cobalt carbonate*

3 Terms and definitions

No terms and definitions are listed in this document.

4 Designation and classification

The product is classified into two grades (BFCo-1 and BFCo-2) according to chemical content. B stands for coating and F stands for powders. The product is classified into two classifications (a and b) according to the Fisher number, with a total of four designations including BFCo-1a, BFCo-1b, BFCo-2a and BFCo-2b.

5 Technical requirements

5.1 Chemical compositions

The chemical compositions of the product shall comply with the requirements in Table 1. If the buyer has other special requirements for chemical compositions of the products, it may be determined by negotiation between the supplier and the buyer.

1. Chemical compositions

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mass fraction % | | | | | | | | | | | | | | | |
| Designation | Primary element, ≥ | Impurity content, ≤ | | | | | | | | | | | | | |
| Co | Ni | Cu | Fe | Ca | Mg | Pb | Zn | Cd | Mn | Na | Al | Si | S | Cr |
| BFCo-1 | 99.9 | 0.003 | 0.001 | 0.003 | 0.003 | 0.002 | 0.001 | 0.001 | 0.001 | 0.002 | 0.003 | 0.001 | 0.001 | 0.003 | 0.001 |
| BFCo-2 | 99.8 | 0.005 | 0.003 | 0.006 | 0.005 | 0.005 | 0.003 | 0.003 | 0.003 | 0.005 | 0.008 | 0.003 | 0.002 | 0.005 | 0.003 |
| NOTE: Cobalt content is 100% minus the measured sum of the impurity elements listed in the table. | | | | | | | | | | | | | | | |

5.2 Fisher number, apparent density, hydrogen loss, and paraffin content of the product

The Fisher number, apparent density, hydrogen loss, and paraffin content of the product shall comply with the requirements of Table 2. If the buyer has other special requirements, it may be determined by negotiation between the supplier and the buyer.

1. Fisher number, apparent density, hydrogen loss, and paraffin content

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Designation | Fisher number  μm | Apparent density g/cm3 | Hydrogen lossa  % | Paraffin content % |
| BFCo-1a | 1.50～＜2.00 | 0.60～1.20 | 2.3～2.6 | 1.7～2.3 |
| BFCo-2a |
| BFCo-1b | 1.00～＜1.50 |
| BFCo-2b |
| a: In addition to the characterized oxygen content, the hydrogen loss listed in this table also includes the mass loss of paraffin under experimental conditions. The hydrogen loss after subtracting the paraffin content should be ≤0.6%. | | | | |

5.3 Appearance quality

The product shall be gray-black powder, with no other colors mixed, no caking and no visible foreign inclusions.

6 Test methods

6.1 The chromium content of the product shall be determined according to HG/T 4520. The other impurity elements content, shall be determined according to YS/T 281 (All parts).

6.2 The Fisher number of the product shall be determined according to GB/T 3249.

6.3 The apparent density of the product shall be determined according to GB/T 1479.1.

6.4 The hydrogen loss of the product shall be determined according to GB/T 5158.2.

6.5 The paraffin content of the product shall be determined according to provisions in Annex A.

6.6 The appearance quality of the product shall be inspected visually.

7 Inspection rules

7.1 Inspection and acceptance

7.1.1 The products shall be inspected by the supplier to ensure the quality of the products is consistent with the provisions of this document and the order.

7.1.2 The buyer may inspect the received products according to the provisions of this document or order. If the inspection results are inconsistent with the provisions of this document or order, the buyer shall inform the supplier within one month upon the receipt date of the products, and both parties shall solve the problem by negotiation. In case of arbitration, arbitration sampling shall be conducted at the buyer's site by the supplier and the buyer.

7.2 Lots

The products shall be submitted for inspection in lots, and each lot shall consist of product of the same production cycle, designation and classification. The weight of each lot shall not exceed 3 tons. If the buyer has other special requirements for the products, it may be determined by negotiation between the supplier and the buyer.

7.3 Inspection items and sampling

The inspection items and sampling methods of the products shall comply with the requirements in Table 3.

1. Inspection items and sampling

|  |  |  |  |
| --- | --- | --- | --- |
| Inspection item | Sampling provision | Clause of requirements | Clause of test method |
| Chemical component | According to the provisions of  GB/T 5314 | 5.1 | 6.1 |
| Fisher number | 5.2 | 6.2 |
| Apparent density | 6.3 |
| Hydrogen loss | 6.4 |
| Paraffin content | 6.5 |
| Appearance quality | Barrel-by-barrel (bag) | 5.3 | 6.6 |

7.4 Inspection results judgement

7.4.1 If any inspection result of chemical compositions, Fisher number, apparent density, hydrogen loss or paraffin content does not comply with the this document and order, double quantity of samples shall be taken from the lot of product and be tested again. If any of the retest result is still unqualified, this lot of the product is judged as unqualified.

7.4.2 If the appearance quality of the product does not comply with the this document and order, the barrel of the product is judged as unqualified.

8 Marking, packaging, transportation, storage and accompanying documents

8.1 Marking

8.1.1 Product marks

For products that pass the inspection, the sealed packaging of products shall be accompanied by the following marks (or labels) :

1. stamp from the quality supervision department of the supplier;
2. name of the supplier;
3. name and designation of products;
4. lot number of product.

8.1.2 Packaging marks

The outer packaging of the product shall be marked with the following contents:

1. name of the supplier;

b) name of the product;

c) trademark;

d) designation;

e) lot number of the product;

f) designation;

g) production date;

h) the words or signs of “keep away from moisture”, “handle with care”, “this side up”, etc.

8.2 Packaging

Products that pass the inspection are packed shall be vacuum-packed in sealed packing bags or inserted with protective gas, and put in packing barrels with seal covers. The net weight of each barrel shall not be greater than 50 kg. If

the buyer has other special requirements for the packaging, it may be determined by negotiation between the supplier and the buyer.

8.3 Transportation

The product shall be protected from rain and moisture during transportation. The transport vehicle(s) shall be clean. During handling and transportation, the product shall be handled with care, and shall not be rolled, inverted or violently impacted, and the sealed packaging of the product shall be protected from damage.

8.4 Storage

The product shall be stored in an environment that is dry, ventilated and without corrosive gas, and protected from moisture and corrosion.

8.5 Accompanying documents

Each lot of products shall have accompanying documents, which shall include the information of supplier, product information, this document number, production date or packaging date, and should also include:

1. product quality assurance, which indicate:

·main properties and technical parameters of the product;

·product characteristics (including manufacturing process and raw material characteristics);

·responsibility for product quality;

·product quality certification and inspection report with the stamp of supplier's quality department.

1. product certification, which indicate:

·inspection items and results or inspection conclusion;

·lot number;

·inspection date;

·signature or stamp of inspector.

c) inspection report of product quality control progress and final product report;

d) product instructions: correct handling, use and storage methods, etc.;

e) others.

9 Order content

The buyer may, according to its own needs, list the following contents in the order form for the products listed in this document:

a) product name;

b) designation；

c) product net weight;

d) reference to this document;

e) other special requirements negotiated between the supplier and buyer in this document;

f) others.

Annex A  
(Normative)  
Determination of paraffin in coated cobalt powders—heating weight loss method

A.1 Principle

Due to the low boiling point of paraffin (300 ℃-500 ℃), heat it for 2.5 h-3.5 h in a hydrogen-protective atmosphere to vaporize and separate it, and calculate the paraffin content according to the mass loss.

A.2 Reagent

Hydrogen: Oxygen content is not greater than 0.005% (mass fraction), and dew point is not higher than -45 ℃.

A.3 Apparatus

A.3.1 Balance

It shall have sufficient load capacity and accuracy of 0.000 1 g.

A.3.2 Electric tube furnace

At the specified temperature of 350 ℃±10 ℃, it can be operated continuously, with a control system to maintain the temperature of the shipshape vessel holding section in the tube within the specified temperature range.

A.3.3 Airtight pipe

It is made of quartz or refractory material, the inner diameter of the tube should be between 25 mm and 40 mm, and the tube length should be so that it extends 200 mm at each end of the furnace tube.

A.3.4 Temperature measuring equipment

It is composed of a fully enclosed thermocouple and a display recorder, which can control the measurement temperature error range within ±5 ℃.

A.3.5 Shipshape vessel

A.3.5.1 It is advisable to use a high-purity alumina ceramic shipshape vessel with a polished surface, but other materials (such as quartz or nickel) can also be used. The size of the shipshape vessel should ensure that the powder can be evenly distributed, and the powder height is not greater than 3 mm.

A.3.5.2 The new shipshape vessel shall be pre-treated in a hydrogen stream at a specified test temperature for 1 h before use and placed in a dryer.

Note: The shipshape vessel used in this method is only used for testing waxed cobalt powders. If the quality of the vessel permits, it can be reused if it is carefully cleaned after each measurement and stored in a dryer.

A.4 Sampling

A.4.1 The waxed cobalt powder sample should be measured immediately after being received.

A.4.2 Two samples shall be taken for parallel testing.

A.4.3 Weigh about 1 g of waxed cobalt powder at a time, and the reading is accurate to 0.000 1 g.

A.5 Analysis steps

The paraffin content in the waxed cobalt powder sample is determined by the following steps:

a) Inject hydrogen, adjust the smooth hydrogen flow through the furnace tube, control the gas flow rate by the rotor flowmeter to be no less than 25 mm/s, and carry out the bursting test by sampling at the furnace mouth. It shall be ignited only after the test is qualified.

b) Power on and heat up, so that it meets the temperature of 350 ℃±10 ℃;

c) Weighing the shipshape vessel (*m1*), accurate to 0.000 1 g;

d) Evenly distribute the sample throughout the shipshape vessel, and weigh it (*m2*) containing the sample, accurate to 0.000 1 g;

e) When the temperature of the electric furnace reaches the specified temperature, push the shipshape vessel with the sample after weighing into the middle of the temperature equalizing zone slowly from the hydrogen outlet end and preserve the heat for 3 hours;

f) After heat preservation, slowly pull the shipshape vessel from the hydrogen outlet to the cooling area, cool it for 15 minutes, and then move it to the dryer to cool it to room temperature (below about 35 ℃);

g) Weigh the shipshape vessel (*m3*) that has been cooled to room temperature, accurate to 0.000 1 g.

A.6 Result calculation

Paraffin content is expressed as a mass fraction (retain 1 decimal place):

*m1*: The mass of the empty shipshape vessel, in grams (g);

*m2*: The mass of the shipshape vessel filled with sample before test, in grams (g);

*m3*: The mass of the shipshape vessel filled with sample after test, in grams (g);

Calculation results are expressed to one decimal place. The rules of rounding off for numerical values shall be determined according to GB/T 8170.