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

YS/T 301-2022

Replace YS/T 301—2007

Cobalt concentrates

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*(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 *Directives for Standardization—Part 1: Rules for the Structure and Drafting of Standardizing Documents*.

This document replaces the YS/T 301—2007 *Cobalt concentrates* in whole. In addition to a number of structural adjustments and editorial changes, the following technical deviations have been made with respect to the YS/T 301—2007.

a）Normative references are modified. "GB/T 1250 *Representation method and determination method of limit value*", "GB/T 11713 *Standard method for analysis of low specific activity γ radioactive samples by semiconductorγspectrometer*", " YS/T 1148 *Packaging, marking, transportation and storage of non-ferrous metal concentrate*”are deleted ;" GB/T 8170 *Representation and determination of numerical reduction rule and limit value*" , "YS/T472.2 *Chemical analysis methods of nickel concentrate and cobalt matte concentrate determination of chromium content—Flame atomic absorption spectrometry*" are added (see Chapter 2, 2 of the 2007 deition);

b）the limit requirements of impurity elements are modified. lead and arsenic are modified from 0.10% to 0.05% and cadmium is modified from 0.05% to 0.01% ; added the content requirement of chromium content of cobalt concentrate to no more than 0.05% (see 5.1, 4.2 of the 2007 deition) ;

c） the cobalt content of grade Ⅲ and grade Ⅳ of cobalt sulfide concentrate is modified, the lower limit of cobalt content of grade Ⅲ is modified from 10.0% to 8.0%, and the lower limit of cobalt content of grade Ⅳ is modified from 6.0% to 5.0% (see 5.1,4.2.1 of the 2007 deition);

d） the cobalt content of grade Ⅳ of mixed cobalt concentrate is modified, the lower limit of cobalt content of grade Ⅳ is modified from 6.0% to 5.0% (see 5.1,4.2.3 of the 2007 deition);

e) the physical properties are modified, "The moisture content (mass fraction) of cobalt concentrate shall not be greater than 12%, and no greater than 8% in winter. The particle size of cobalt concentrate shall be less than 0.175 mm (80 orders) "is modified to" the moisture content (mass fraction) of the product shall not be greater than 12%. The particle size of the product shall not be greater than 0.175 mm " (see 5.2, 4.3 of the 2007 deition);

f) the appearance quality of the product is modified from "apparent quality" to "appearance quality"; "Color and shape of cobalt concentrate shall be uniform and foreign inclusions shall not be mixed" is modified to "The same type and the same batch of products shall have the same color, and shall not be mixed with other inclusions. The surface of cobalt sulfide concentrate products is prone to oxidation, allowing differences in color" (see 5.3.1 ,4.4 of the 2007 deition);

g) the description of appearance quality "Product shall be powdered" is added(see 5.3.2);

h) the determination method of chromium is added (see 6.1.4);

i) the weight of a single batch of products in the batch mode "determined by the supplier and buyer through negotiation" is added (see 7.2);

j) the product sampling and sample preparation methods are modified(see 7.3, 6.3 of the 2007 deition);

k) the inspection results judgement is modified(see 7.4, 6.4 of the 2007 deition);

l) the "marking, packaging, transportation, storage and accompanying documents" are modified(see Chapter 8, 7 of the 2007 deition).

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 the National Technical Committee on Nonferrous Metals of Standardization Administration of China (SAC/TC 243).

The previous editions of this document are as follows:

— the First edition was issued in 1975 as YB 826-1975, the first revision was issued in 1984 as ZB/D 41001-1984, the second revision was issued in 1994 as YS/T 301-1994, the third revision was issued in 2007 as YS/T 301-2007;

— This is the fourth revision edition.

Cobalt concentrate

1 Scope

This document specifies the product classification, technical requirements, test methods, inspection rules, marking, packaging, transportation, storage, accompanying documents and orders of cobalt concentrate.

This document is applicable to the cobalt concentrate of cobalt-containing ore obtained by flotation or other enrichment methods for the manufacture of metal cobalt, cobalt oxides or other cobalt-containing compounds.

**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 8170 *Representation and determination of numerical reduction rules and limit values*

GB/T 14260 *General rules for sampling and sample preparation of bulk heavy non-ferrous metal flotation concentrate*

GB 20664 *Natural radioactive limits for non-ferrous metal mineral products*

YS/T 349.1 *Methods for chemical analysis of cobalt sulfide concentrate—Part 1: Determination of cobalt content—Potentiometric titration method*

YS/T 349.3 *Methods for chemical analysis of cobalt sulfide concentrate—Part 3: Determination of manganese content—Flame atomic absorption spectrometry*

YS/T 349.4 *Methods for chemical analysis of cobalt sulfide concentrate—Part 4: Determination of silica content ——Potassium fluorosilicate capacity method*

YS/T 472 *(All parts) Methods for chemical analysis of nickel concentrate and cobalt matte concentrate*

3 Terms and definitions

The following terms and definitions shall apply to this document.

3.1

mixed cobalt concentrates

Cobalt concentrate not present in the form of pure sulfide or pure oxide obtained by cobalt ore enrichment.

4 Product classification

According to the chemical composition, the products are divided into cobalt sulfide concentrate, cobalt oxide concentrate and mixed cobalt concentrate.

5 Technical requirements

5.1 Chemical compositions

5.1.1 Cobalt sulfide concentrate

Cobalt sulfide concentrate is divided into first, second, third and fourth grade according to its cobalt content, and its chemical composition shall comply with the provisions of Table 1.

Table 1 Chemical compositions of cobalt sulfide concentrate

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Grade | Chemical compositions (mass fraction) % | | | | | | | |
| Co,  Min | Contents of impurity, Max | | | | | | |
| Mn | Pb | As | Cd | Cr | Hg | SiO2 |
| First grade | 20.0 | 0.2 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 | 5.0 |
| Second grade | 15.0 | 0.2 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 | 10.0 |
| Third grade | 8.0 | 0.5 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 | 15.0 |
| Fourth grade | 5.0 | 0.5 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 | 20.0 |

5.1.2 Cobalt oxide concentrate

Cobalt oxide concentrate is divided into first, second and third grade according to its cobalt content, and its chemical composition shall comply with the provisions of Table 2.

Table 2 Chemical compositions of cobalt oxide concentrate

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Grade | Chemical compositions (mass fraction) % | | | | | | |
| Co,  Min | Contents of impurity, Max | | | | | |
| Mn | Pb | As | Cd | Cr | Hg |
| First grade | 10.0 | 2.0 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 |
| Second grade | 8.0 | 3.0 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 |
| Third grade | 5.0 | 4.0 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 |

5.1.3 Mixed cobalt concentrate

Mixed cobalt concentrate is divided into first, second, third and fourth grade according to its cobalt content, and its chemical composition shall comply with the provisions of Table 3.

Table 3 Chemical compositions of the Mixed cobalt concentrate

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Grade | Chemical compositions (mass fraction) % | | | | | | |
| Co,  Min | Contents of impurity,Max | | | | | |
| Mn | Pb | As | Cd | Cr | Hg |
| First grade | 15.0 | 1.0 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 |
| Second grade | 12.0 | 1.5 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 |
| Third grade | 9.0 | 2.0 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 |
| Fourth grade | 5.0 | 3.0 | 0.05 | 0.05 | 0.01 | 0.05 | 0.001 |

5.2 Physical properties

The moisture content (mass fraction) of the product shall not be greater than 12%.

The particle size of the product shall not be greater than 0.175 mm.

5.3 Appearance quality

5.3.1 The same type and the same batch of products shall have the same color, and shall not be mixed with other inclusions. The surface of cobalt sulfide concentrate products is prone to oxidation, allowing differences in color.

5.3.2 The product shall be powdered.

5.4 Natural radioactivity

The natural radioactivity limit of the product shall comply with the provisions of the GB 20664.

5.5 Other requirements

If the buyer has special requirements for the product, it may be determined by negotiation between the supplier and buyer and indicated in the order.

6 Test methods

6.1 Chemical compositions

6.1.1 The cobalt content of the product shall be determined according to YS/T 349.1.

6.1.2 The manganese content of the product shall be determined according to YS/T 349.3.

6.1.3 The silicon dioxide content of the product shall be determined according to YS/T 349.4.

6.1.3 The cadmium, chromium, mercury, lead and arsenic contents of the product shall be determined according to YS/T 472 (all parts).

6.2 Physical properties

6.2.1 The moisture content of the product shall be determined according to GB/T 14260.

6.2.2 The determination of product particle size is carried out using a 0.175mm standard sieve.

6.3 Appearance quality

The appearance quality of the product shall be inspected visually.

6.4 Natural radioactivity

The measurement of the natural radioactivity of the product shall be performed as specified in the GB 20664.

7 Inspection rules

7.1 Inspection and acceptance

7.1.1 The products shall be inspected by the supplier or a third party to ensure that the quality of the products complies 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. If the inspection result is inconsistent with the provisions of this document or the 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,it shall be settled the supplier and buyer through negotiation.

**7.2 Batch**

The products shall be submitted for acceptance in batches, and each batch shall be composed of products of the same type and the same grade, and the weight of each batch shall not be greater than 60t or shall be determined by the supplier and the buyer through negotiation.

**7.3 Sampling and sample preparation**

7.3.1 The products shall be bagged and fully sampled according to the packaging unit. The sampling method shall be determined by the trading parties through on-site negotiation. The samples shall be reduced to no less than 3.5 kg. Moisture content determination of the samples shall be carried out first, and then the samples shall be broken and reduced to not less than 500 g, and be divided into four parts, as the component samples.

7.3.2 The number of prepared samples can also be distributed by the supplier and the buyer as required. One for the buyer, one for the supplier, one shall be signed and confirmed by both parties on site for arbitration, and one shall be kept as a backup. The arbitration samples shall be kept by the third-party testing institution, and the backup samples shall be kept by the buyer until the trade settlement of both parties.

**7.4 Inspection results judgement**

7.4.1 The values of the inspection results shall be rounded according to the provisions of GB/T 8170, and the rounding value comparison method shall be used for judgement.

7.4.2 If the chemical composition, physical properties and natural radioactivity do not comply with the provisions of this document, the batch of products is judged as unqualified.

7.4.3 If the appearance quality does not comply with the provisions of this document, the bag of product is judged as unqualified.

**8 Packaging, transportation, storage, marking and accompanying documents**

**8.1 Marking**

The outer package of the product shall be printed with a trademark and a label, which indicates:

a) name and address of the supplier ;

b) product name;

c) batch number;

d) weight;

e) date of manufacture ;

f) the words or signs of "rainproof" and "scratchproof".

**8.2 Packaging, transportation and storage**

8.2.1 The products shall be packed in ton bags, with a net weight of 0.8t ~1.5 t.

8.2.2 During transportation, the products shall be carefully placed and protected to prevent packaging rupture and rainwater soaking, and shall be stacked and transported separately from other items.

8.2.3 The products shall be stored in dry, ventilated and non-corrosive warehouses, and shall not be stored together with acids, alkalis, oils and other chemicals to prevent moisture and corrosion.

**8.3 Accompanying documents**

Each batch of products shall be accompanied by accompanying documents, which indicates:

a) the name, address and contact information of the supplier;

b) product name;

c) batch number;

d) the batch weight;

e) delivery date.

9 Order contents

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) product category and grade ;

c) special requirements for chemical composition ;

d) net weight and number of bags ;

e) reference to this document;

f) others.

