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Synthetic cryolite

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(*English Translation*)

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General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China

Standardization Administration of the People's Republic of China

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 standard is drafted in accordance with the rules given in the GB/T 1.1-2009.

This standard replaces the GB/T 4291-2007 *Synthetic cryolite* in whole.

In addition to a number of editorial changes, the following technical deviations have been made with respect to the GB/T 4291-2007.

—The normative references GB/T 1250 was modified as GB/T 8170(See clause 2, clause 2 of 2007 edition);

—Added the reserved digits of the molecule ratio calculation results(See subclause 4.1.1);

—Added the class of synthetic cryolite(See subclause 4.2);

—Adjusted the ferric oxide(Fe2O3),sulfate(SO42-), calcium oxide(CaO) and ignition loss content regulations of grade CH-0; Adjusted the ferric oxide(Fe2O3),sulfate(SO42-) and calcium oxide(CaO) content regulations of grade CH-1; Adjusted the sulfate(SO42-) content regulations of grade CM-0 and grade CM-1(See subclause 4.2);

—Put the content of note 2 in Table 1 into the requirements(See subclause 4.2, subclause 4.3 of 2007 edition);

—Added the regulations of appearance quality (See 4.3);

—Deleted the net bag weight of 40 kg in clause 7.1(See subclause 7.1 of 2007 edition).

This standard was proposed by the China Nonferrous Metals Industry Association.

This standard was prepared by SAC/TC 243 State Administration of China for Standardization of Nonferrous Metals.

The previous editions of GB/T 4291 are as follows:

—GB/T 4291-1984, GB/T 4291-1999, GB/T 4291-2007.

# Synthetic cryolite

1. Scope

This stanard specifies the requirements, test methods, conformity with standard, packaging, signing, transporting, storing and order(or contract) content of synthetic cryolite.

This stanard is applicable to cryolite synthesized by hydrofluoric acid, hexafluorosilicic acid or sodium fluorosilicate which is mainly used for the aluminum production.

1. Normative references

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 8170, *Rules of rounding off for numerical values & expression and judgement of limiting values*

YS/T 273(all parts), *Chemical analysis methods and physical properties of cryolite*

1. Definitions

molecule ratio of synthetic cryolite

molar ratio of NaF to AlF3 in the synthetic cryolite product

1. Requirements
   1. Grade and class
      1. According to the molecule ratio, synthetic cryolite shall be divided into two classes. One class with molecule ratio between 2.80 and 3.00 shall be defined as high molecule ratio synthetic cryolite, and the other one with molecule ratio between 1.00 and ＜2.80 shall be defined as ordinary synthetic cryolite. Molecule ratio shall be calculated according to formula (1):

 ………………………(1)

In formula (1):

*Na* Mass fraction of sodium in synthetic cryolite product, %;

*Al* Mass fraction of aluminum in synthetic cryolite product, %;

26.9815Relative atomic mass of aluminum;

22.9897Relative atomic mass of sodium.

The calculation results shall be kept to the second decimal place.

* + 1. Synthetic cryolite shall be devided into four grades such as CH-0, CH-1, CM-0 and CM-1. Four grades shall be represented by two English letters and a horizontal line "-" followed by a number,The letter C shall represent the identification code of synthetic cryolite (C is the first letter of cryolite); The letter H and M shall represent the class of synthetic cryolite where H is the high molecule ratio synthetic cryolite, M is the ordinary synthetic cryolite, and the number (0 or 1) is the order number.
  1. Chemical composition and physical property

The chemical composition and physical property of synthetic cryolite shall meet the regulations in Table 1. Special requirements for chemical composition and physical properties proposed by the purchaser shall be specified in the order (or contract) after being determined by the supplier and the purchaser.

Table 1—Regulations of chemical composition and physical property

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| class | grade | chemical composition  % | | | | | | | | | physical property |
| F | Al | Na | SiO2 | Fe2O3 | SO42- | CaO | P2O5 | H2O | ignition loss  % |
| Minimum | | Maximum | | | | | | | |
| high molecule ratio synthetic cryolite | CH-0 | 52.0 | 12.0 | 33.0 | 0.25 | 0.03 | 0.50 | 0.10 | 0.02 | 0.20 | 1.5 |
| CH-1 | 52.0 | 12.0 | 33.0 | 0.36 | 0.05 | 0.80 | 0.15 | 0.03 | 0.40 | 2.5 |
| ordinary synthetic cryolite | CM-0 | 53.0 | 13.0 | 32.0 | 0.25 | 0.05 | 0.50 | 0.20 | 0.02 | 0.20 | 2.0 |
| CM-1 | 53.0 | 13.0 | 32.0 | 0.36 | 0.08 | 0.80 | 0.60 | 0.03 | 0.40 | 2.5 |

* 1. Appearance quality

Cryolite shall be white powder or granule, and agglomerates larger than 10 mm shall be not allowed in the product.

1. Test method
   1. Chemical analysis methods and physical properties of synthetic cryolite shall be in accordance with YS/T 273(all parts). Rounding comparison method is used to determine the analysis value. The regulation of rounding off for numerical values shall be in accordance with GB/T 8170. The figures of rounded values shall be consistent with the limit values listed in the table.
   2. Appearance quality shall be checked by visual inspection, and the size of the agglomerates in the product shall be measured with a tool of corresponding accuracy.
2. Conformity with standards
   1. Inspection and acceptance

6.1.1 Synthetic cryolite shall be inspected by the supplier's technical control department who fills in the product quality certificate to ensure the product quality in accordance with the regulations of this standard.

6.1.2 If the purchaser has any doubt about the product quality, the purchaser shall inform the supplier within 1 month after products are received, and the problem may be solved through consultation by the supplier and the purchaser. If arbitration is required, the arbitration sampling will be preceded by both sides.

* 1. Batch

The products shall be inspected for acceptance in batches, and each batch shall be consisted of the same grade synthetic cryolite with batch weight no more than 60 t.

* 1. Inspection item

For each batch of synthetic cryolite, inspection of chemical composition, physical property and appearance quality shall be carried out before leaving the factory.

* 1. Sampling and preparation
     1. Sampling volume

The quantity of sampling bags shall be in accordance with Table 2.

Table 2—Sampling volume

|  |  |  |  |
| --- | --- | --- | --- |
| total quantity, n | the minimum bags selected | total quantity, n | the minimum bags selected |
| 1～10 | all | 182～216 | 18 |
| 11～49 | 11 | 217～254 | 19 |
| 50～64 | 12 | 255～296 | 20 |
| 65～81 | 13 | 297～343 | 21 |
| 82～101 | 14 | 344～394 | 22 |
| 102～125 | 15 | 395～450 | 23 |
| 126～151 | 16 | 451～512 | 24 |
| 152～181 | 17 | ＞512 | a3×*n*1/3 |
| a Results shall be rounded to integer. | | | |

* + 1. Sampling method

In each selected sampling bag, take equivalent sample by using a copper tube probe with a diameter of 19 mm ~ 25 mm to insert the 3/4 depth of the sample bag along the diagonal. The total sample weight shall be no less than 2 kg.

6.4.3 Sample preparation

The sample shall be thoroughly mixed, and reduced to no less than 500 g by using the quarter method.Then divide it into three parts. One is for arbitration analysis, and the other two are for the supplier and the purchaser. The remaining samples shall be used for appearance quality inspection.

* 1. Rejection and retest

6.5.1 When any sample fails in terms of chemical composition and physical property, the whole batch shall be unqualified. The supplier is allowed to redefine the grade and retest in accordance with the new grade.

6.5.2 When any sample is failed in terms of appearance quality, it shall be resolved through consultation between the supplier and the purchaser.

1. Packaging, Signing, transporting, storing and quality certificate
   1. Packaging

The product shall be packed in the film covered plastic woven bag or the plastic film lined bag. The net weight of each bag is 25 kg, 50 kg or 1 000 kg. When the purchaser has special requirements for packaging, it shall be specified in the order (or contract) after negotiated and determined by the supplier and the purchaser.

* 1. Signing

The packaging bag should be labeled with the following content:

1. product name;
2. grade;
3. batch number;
4. net weight;
5. rainproof logo;
6. this standard number;
7. supplier name.
   1. Transporting

The product should be transported in a dry, clean and waterproof compartment.

* 1. Storing

The product shall be stored in a dry warehouse to prevent damage, pollution and moisture, and stacked in batches.

* 1. Quality certificate

Every batch of the product shall be attached with quality certificate, with the following content:

1. product name;
2. grade;
3. batch number;
4. weight or pieces;
5. the values of chemical composition and physical property;
6. molecule ratio;
7. date of manufacture;
8. this standard number;
9. inspection stamp from the supplier's quality control department;
10. supplier name.

Order (or contract) content

The product order (or contract) content of this standard shall include the following content:

1. product name;
2. product grade;
3. the values of chemical composition and physical property;
4. product quantity;
5. this standard number;
6. other content required to specified in the contract.

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