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Recycling materials for cast aluminium alloys

再生铸造铝合金原料

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Table of Contents

Recycling materials for cast aluminium alloys

1 Scope

This Standard specifies the classification, requirements, test methods, inspection rules, marking, packaging, transportation, storage, quality certificate and order form (or contract) contents of recycling materials for cast aluminium alloys.

This Standard applies to recycling materials for cast aluminium alloys (hereinafter referred to as materials) that are obtained after recycling and processing of recycling aluminium in used vehicles, aluminium appliances, and mechanical equipment.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 7999, Optical emission spectrometric analysis method of aluminum and aluminum alloys

GB/T 8005.1, Aluminium and aluminium alloys - Terms and definitions - Part 1: product and method of processing and treatment

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

GB/T 17432, Methods of sampling for analyzing the chemical composition of wrought aluminum and aluminum alloys

GB/T 20975, Methods for chemical analysis of aluminium and aluminium alloys

YS/T 491, Flux for wrought aluminium and aluminium alloy

3 Terms and definitions

Terms and definitions determined by GB/T 8005.1 and the following ones are applicable to this document.

3.1 Recycling materials for cast aluminium alloys

The materials that meet the relevant requirements of this Standard and can be used to produce cast aluminium alloy ingots or products, which are obtained from recycled cast aluminium alloys or mixed metals that contain aluminium after processing, such as sorting.

3.2 Foreign material

Non-metallic substance that is doped or adhered to the raw material.

Note: It includes dust, wood, textiles, plastics, glass, stone, paper, sand, rubber, sludge, etc.; it doesn't include the packaging of this product and other substances that need to be used during transportation.

3.3 Volatile substance

Impurities that can be separated from raw materials after proper heat treatment at a temperature below the melting point of the metal.

3.4 Aluminium and aluminium alloy content

The mass fraction of the aluminium material that can be selected from the raw material.

3.5 Total metal content

The mass fraction of the metallic material that can be selected from the raw material.

Note: Metallic material mainly includes aluminium, silicon, copper, magnesium, zinc, etc.

3.6 Metal recovery rate

The mass fraction of metallic materials that are produced from raw materials through pretreatment and smelting treatment in accordance with the methods that are specified in this Standard.

4 Classification

Raw materials can be divided into three types: castings, recycled aluminium ingots, and aluminium blocks. The raw material description and source are shown in Table 1; typical photos of raw materials are shown in Appendix A.

c) The radiative contamination level on surface α and β of the raw material is: for the average value of the maximum test level of 300 cm^2 on any part of the surface, α does not exceed 0.04 Bq/cm^2, and β does not exceed 0.4 Bq/cm^2.

5.11 Other requirements

5.11.1 The raw materials shall not be mixed with flammable materials, and shall not be mixed with explosives such as waste bombs and shells.

5.11.2 The raw materials shall not be mixed in closed containers or pressure vessels.

6 Test method

6.1 Appearance quality

Visually inspect the appearance of the sample. The sample should be laid flat on a clean surface for inspection.

6.2 Dimensions

6.2.1 General inspection

Visually check the sample dimensions. The sample should be laid flat on a clean surface for inspection. When it is suspected that it does not meet the requirements, perform the arbitration inspection in accordance with 6.2.2.

6.2.2 Arbitration inspection

6.2.2.1 Casting and recycled aluminium ingot

Use a measuring instrument of appropriate accuracy to measure the dimensions.

6.2.2.2 Aluminium block

6.2.2.2.1 Weigh the sample mass and record it as m.

6.2.2.2.2 Use a sieve shaker (see Appendix B) to sieve the sample; the vibration time is 5 minutes; use an electronic scale, of which the accuracy is 0.5 kg, to weigh the mass of the sieved material, and record it as m'.

6.2.2.2.3 Calculate the sieving pass rate w_s of the aluminium block sample according to Formula (1); express the value in %; display the calculation result to the single digit; round off according to the provisions of GB/T 8170.

7.1.1 The product shall be inspected by the supplier before delivery, so as to ensure that the product quality complies with the requirements of this Standard and the order form (or the contract); the supplier shall fill in the quality certificate.

7.1.2 The buyer or the relevant regulatory authority may conduct a re-inspection of the received products in accordance with the provisions of this Standard. If the re-inspection result is inconsistent with the requirements of this Standard and the order form (or contract), a written form shall be submitted to the supplier; the issue shall be settled by negotiation between the supplier and the buyer. Arbitration, if required, may be carried out by an organization which is recognized by both the supplier and the buyer; the sampling shall be jointly done by the buyer.

7.2 Batch

7.2.1 Raw materials shall be submitted for inspection in batches. The batch weight and batch weight deviation shall be determined through consultation between the supplier and the buyer.

7.2.2 Each batch of castings consists of similar castings.

7.2.3 Each batch of recycled aluminium ingots consists of no more than 5 molten ingots.

7.2.4 Each batch of aluminium blocks consists of aluminium blocks of the same source and size.

7.3 Inspection items and sampling

7.3.1 Inspection items

For each batch of raw materials, the appearance quality, dimensions, foreign material content, chemical composition, radioactive contaminants and other requirements shall be inspected; the volatile substance content, fracture structure of recycled aluminium ingots, aluminium and aluminium alloy content, total metal content, and metal recovery rate shall be determined by the supplier process assurance. The buyer or the relevant regulatory authority may conduct spot checks on process assurance items.

7.3.2 Sampling regulations

7.3.2.1 Take samples in batches; take 100% of samples to perform the radioactive contamination test; see Table 7 for other test sampling requirements.

repeated test results are qualified, judge this batch of raw materials to be qualified; otherwise, judge this batch to be inconsistent with the requirements of this Standard.

7.4.2 If the test result of dimensions of any sample is unsatisfactory, double the number of samples shall be taken from this batch of samples for a repeated test. If all the repeated test results are qualified, judge this batch of raw materials to be qualified; otherwise, judge this batch to be inconsistent with the requirements of this Standard.

7.4.3 If the test result of chemical composition analysis of the sample is unsatisfactory, double the number of samples shall be taken from this batch of samples for a repeated test. If all the repeated test results are qualified, judge this batch of raw materials to be qualified; otherwise, judge this batch to be inconsistent with the requirements of this Standard.

7.4.4 If the test result of foreign material, aluminium and aluminium alloy content, total metal content, metal recovery rate, volatile substance, and fracture structure of any sample is unsatisfactory, double the number of samples shall be taken from this batch (when the sample size is insufficient, take double the samples from this batch according to the provisions of Table 7); repeat the test for unqualified items. If the repeated test result is qualified, judge this batch of raw materials to be qualified; otherwise, judge this batch to be inconsistent with the requirements of this Standard.

7.4.5 If the test result of radioactive contaminants of any sample is unsatisfactory, judge the batch to be inconsistent with the requirements of this Standard.

7.4.6 If the test result of other requirements of any sample is unsatisfactory, judge the batch to be inconsistent with the requirements of this Standard.

8 Packaging, transportation, storage and quality certificate

8.1 Packaging

8.1.1 The raw materials shall be packaged in categories. The specific packaging method shall be determined through consultation between the supplier and the buyer, and shall be indicated in the order form (or contract).

8.1.2 The appearance of the packaging shall be accompanied by a label that contains the following:

a) raw material name;

Appendix B

(Informative)

Vibrating-sieve

B.1 Working mechanism

The rotation of the motor drives the eccentric block, which causes the sieve frame with a fixed size of cavity to vibrate regularly and plays the role of shaking-sieve, which can separate materials of different sizes.

B.2 Basic requirements

B.2.1 Main components

The vibrating-sieve is mainly composed of a vibration system, a sieve frame, a material receiving device, and a shock-absorbing device.

B.2.2 Vibration system

The vibration system includes a motor, a speed-transmission, a rotating shaft, and an eccentric block.

B.2.3 Sieve frame

B.2.3.1 The sieve size of each sieve frame is fixed.

B.2.3.2 The height of the side of the sieve frame is not less than 140 mm; the distance between adjacent sieve frames should be 10 mm ~ 15 mm.

B.2.3.3 There shall be an extraction point at the lower end of the sieve frame.

B.2.3.4 The sieve frame is easy to disassemble.

B.2.4 Material receiving device

B.2.4.1 The extraction direction of two adjacent sieve frames with different sieve sizes is the same.

B.2.4.2 The sieve frame extraction nozzle with the same extraction direction extends 400 mm.

B.2.5 Shock-absorbing device

The shock-absorbing spring is installed at the lower end of the vibrating-sieve frame and shall be vertical to the ground.

Appendix C

(Normative)

Volatile substance test method

C.1 Method overview

Heat the sample to a fixed temperature and maintain the temperature until constant-weight; measure the mass loss, so as to calculate the mass fraction of the volatile substance.

C.2 Test equipment or device

C.2.1 Electronic scale: the maximum weighing is not less than 2 kg; the accuracy is 0.01 g.

C.2.2 High-temperature furnace: the working temperature of the high-temperature furnace can reach 500 °C; the accuracy is ± 5 °C.

C.2.3 Sample plate.

C.2.4 Glass dryer.

C.3 Sample

C.3.1 Use the electronic scale (C.2.1) to weigh the sample; record the sample mass.

C.3.2 When the capacity of the high-temperature furnace (C.2.2) is insufficient, divide the sample into several parts and test independently. The mass of each sample shall be weighed and recorded.

C.4 Test steps

C.4.1 During the test, when the sample plate (C.2.3) and the sample are transferred, use a clamp or a corresponding tool to avoid direct contact with human hands.

C.4.2 Keep the sample plate at 360 °C for 8 hours; then, place it in a glass drier (C.2.4) to cool to room temperature; weigh the mass; record it as m_1; place it in the glass drier for later use.

C.4.3 Remove the sample plate from the dryer; place the sample and flatten it; weigh the mass and record it as m_2.

Appendix D

(Normative)

Preparation method of chemical composition sample and inspection method of metal recovery rate

D.1 Method overview

Melt the rough specimen for chemical composition inspection (or the sample for metal recovery rate inspection) in the melting furnace; then, refine to prepare the sample for the analysis of chemical composition of aluminium alloy. Add the mass of the aluminium alloy ingot, the aluminium content of the aluminium slag, and the mass of the non-aluminium metal material which are obtained after the melt is cooled and solidified; use the ratio of the obtained value to the mass of the sample to calculate the metal recovery rate.

D.2 Reagent

D.2.1 Covering agent: in accordance with YS/T 491, NK5048F2A should be used as the designation.

D.2.2 Refining agent: in accordance with YS/T 491, NK4847F5A should be used as the designation.

D.3 Main tools and equipment

D.3.1 Electronic scale: the accuracy is 0.05 kg.

D.3.2 Melting electric furnace: the melting electric furnace temperature is not less than 1 000 °C; the accuracy is ±15 °C; the furnace capacity is not less than 200 kg. It should use a graphite crucible for melting.

D.3.3 Sampling spoon: in accordance with GB/T 17432.

D.3.4 Sampling mold: in accordance with GB/T 17432.

D.4 Test steps

D.4.1 Weighing

Use the electronic scale (D.3.1) to weigh the rough specimen for chemical composition analysis (or the sample for metal recovery rate inspection); record it as m_x.

D.4.2 Pretreatment

Appendix F

(Informative)

Test methods of radioactive contaminants

F.1 Inspection instrument

The instrument that is used for inspection shall meet the requirements of GB 18871, GB/T 12162.3 and GB/T 5202.

F.2 Measurement of external exposure penetrating radiation dose rate

F.2.1 Measurement of natural environment radiation background value

F.2.1.1 Before performing the measurement of external exposure penetrating radiation dose rate, the local natural environment radiation background value shall be measured and determined.

F.2.1.2 Choose 3 ~ 5 points (which can be used as fixed survey points) that can represent the normal state of the local natural radiation background on the flat open ground without radioactive contamination as the measurement points.

F.2.1.3 Place the measuring probe of the measuring instrument at a height of 1 m above the ground of the measurement point, to measure its external exposure penetrating radiation dose rate. Read the measured value every 10 s; take the average of the 10 readings as the measured value of the point; take the arithmetic mean of the measured values of each measurement point as the average value of normal natural radiation.

F.2.2 Data scanning

F.2.2.1 The raw materials shall have a data scanning for radioactive contamination before passing through the port passage. During the data scanning, place the measuring instrument as close as possible to the surface of the tested object or the surface of the container, car body, warehouse body on which the raw materials are loaded, to perform a data scanning on the surface of the tested object.

F.2.2.2 When it is found that the radioactivity significantly exceeds the management limits of three test indicators during the data scanning, it is judged as unqualified. When the radioactive contamination has been found to exceed the management limits of three test indicators, no further sorting or selection is performed.

F.2.3 Test point distribution

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