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Aluminium oxide used for the production of aluminium — Determination of particles passing a 20 micrometre aperture sieve

Oxyde d'aluminium utilisé pour la production de l'aluminium — Détermination de la finesse des particules: mesure du passant à 20 micromètres

Reference number
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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 23202 was prepared by Technical Committee ISO/TC 226, *Materials for the production of primary aluminium*.

Introduction

This International Standard is based on Australian method, AS 2879.2-2003, *Alumina — Determination of particles passing a 20 micrometre aperture sieve*.

The Minus 20 Micron reference material ASCRM 026 was released in December 2003 by SAI Global, along with a Technical Report on its preparation (TR 2.26-2003, *Certified reference materials — Alumina — Preparation and certification of ASCRM 026*). These are available from SAI through their website:

http://www.standards.com.au/

Aluminium oxide used for the production of aluminium — Determination of particles passing a 20 micrometre aperture sieve

1 Scope

This International Standard sets out a wet-sieving procedure for the determination of the percentage by mass of particles of smelter-grade alumina passing a 20 µm aperture sieve.

This procedure is applicable for aluminas with a −20 µm content up to 4 %.

2 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.

ISO 802:1976, *Aluminium oxide primarily used for the production of aluminium — Preparation and storage of test samples*

ISO 806:2004, *Aluminium oxide primarily used for the production of aluminium — Determination of loss of mass at 300 °C and 1 000 °C*

ISO 3310-3, *Test sieves — Technical requirements and testing — Part 3: Test sieves of electroformed sheets*

3 Principle

A test sample of alumina is sieved on a 20 µm electroformed sieve, using acetone, and the retained material is determined gravimetrically after drying at 300 °C.

4 Safety

Chemicals used may be hazardous or toxic and reference should be made to the appropriate Material Safety Data Sheets.

CAUTION — ACETONE PRESENTS A FLAMMABILITY RISK AND SHOULD BE USED IN A SUITABLE EXTRACTION HOOD.

5 Reagents

5.1 Acetone, analytical reagent grade.

5.2 Desiccant.

Phosphorous pentoxide, activated alumina and molecular sieves have been found to be suitable. Silica gel is not a suitable desiccant.

WARNING — PHOSPHOROUS PENTOXIDE IS A HAZARDOUS MATERIAL AND REFERENCE SHOULD BE MADE TO THE APPROPRIATE MATERIAL SAFETY DATA SHEET.

5.3 Ethanol or methanol, technical grade.

6 Apparatus

Ordinary laboratory equipment and the following.

6.1 Test sieve, consisting of a frame, nominally of diameter 75 mm to 150 mm, with an electroformed 20 μm aperture mesh constructed and tested in accordance with ISO 3310-3. The aperture shape shall be round and the sieving medium shall be supported by a suitable grid to provide adequate strength. The construction materials shall be such that the sieve is resistant to chemical corrosion and no physical damage shall occur as a result of heating to 110 °C. The mesh shall be attached to the frame of the sieve such that particles cannot lodge in any part of the joining seam.

NOTE Two suitable mesh sizes are commonly available, 317# and 570#. The open area of the mesh is approximately 17 % for the 570#, and 3,5 % for the 317#. Thus, the 570# sieve is more efficient but more fragile than the 317# sieve.

6.2 Sieve brush, which is acetone-compatible, of high quality with an unpainted handle and soft bristles.

Any paint on the brush shall be removed.

NOTE 1 Westart Akrilik Filbert #6 or #8 brushes have been found suitable. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

NOTE 2 A stiff-bristled brush (e.g. hog's bristle) is not suitable, as it may bias the analysis high and may also damage the sieve mesh.

NOTE 3 A dark-bristled brush is useful, as any alumina particles adhering to the bristles are easily seen.

6.3 Ovens, fitted with mechanical air circulation and capable of being controlled at (300 ± 10) °C.

6.4 Vacuum desiccator, containing an aluminium heat sink, in accordance with ISO 806, and a tray containing desiccant. A tray containing approximately 250 g of desiccant is suitable.

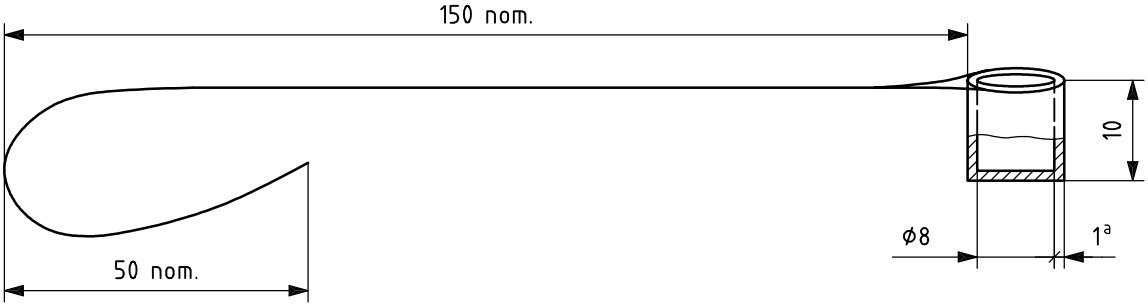
6.5 Platinum crucibles, of 25 ml capacity and approximate dimensions of 35 mm diameter and 40 mm depth and fitted with lids. Two crucible and lid sets are required for each determination. The crucible and lid sets shall be conditioned by placing in an oven maintained at (300 ± 10) °C for 30 min, then cooled and stored in the heat sink in the desiccator.

6.6 Wash bottle, made of polyethylene and filled with reagent-grade acetone.

6.7 Ultrasonic bath.

6.8 Sample scoop, made of stainless steel or brass with a handle. Nominally this scoop shall take up to 0,5 g of alumina when loaded. (See Figure 1.)

Dimensions in millimetres



a Wall thickness (nominal).

Figure 1 — Typical sampling scoop

7 Sampling and sample preparation

A 50 g test sample shall be prepared from the laboratory sample as specified in ISO 802, taking particular care to avoid loss of fine particles through dusting. The test sample shall be mixed well by manual or mechanical tumbling in a sealed container that is not more than 75 % full. After tumbling, let the container rest to allow fines to settle. Each test portion shall be extracted with the sample scoop (6.8), taking a number of grabs to make up the required mass. Manual tumbling shall be repeated between extraction of test portions.

A flat-bladed spatula or vibrating spatula should not be used, as segregation may occur.

8 Procedure

8.1 Check the sieve

The sieve shall be checked to ensure that the mesh is not ruptured and that there is not excessive aperture blinding. When holding the sieve up to a light source, areas of blinding are visible as being darker in appearance. If more than 30 % of the sieve mesh is blinded, the sieve shall be cleaned as specified in 8.2. Larger ruptures in the sieve may be seen by visual inspection. To see smaller ruptures, magnification is required. Inspection using a stereo-microscope is recommended; scan the entire mesh area and the edges to check for ruptures.

NOTE Ruptures can be successfully repaired using silver solder. When a repair is carried out, check the repaired area under magnification to ensure that the rupture is covered and that the solder is bonded to the mesh.

8.2 Cleaning sieve

The procedure shall be as follows.

a) Submerge the sieve in a beaker containing 50 % ethanol or methanol in water. The beaker should be of sufficient diameter to hold the sieve on its side.

b) Place the beaker in an ultrasonic bath and sonicate for 10 min.

c) Remove the sieve and inspect for aperture blinding.

d) Repeat sonication if blinding is still greater than 30 %.

NOTE The sieve is placed on its side during sonication to prevent damage.