INTERNATIONAL STANDARD

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Carbonaceous materials used in the production of aluminium — Baked anodes and cathode blocks —

Part 2: Determination of apparent density and of open porosity using a hydrostatic method

Produits carbonés utilisés pour la production de l'aluminium — Anodes cuites et blocs cathodiques —

Partie 2: Détermination de la masse volumique apparente et de la porosité ouverte par une méthode hydrostatique

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition, ISO 12985-2:2000, of which it constitutes a minor revision.

A list of all parts in the ISO 12985 series can be found on the ISO website.

Carbonaceous materials used in the production of aluminium — Baked anodes and cathode blocks —

Part 2: Determination of apparent density and of open porosity using a hydrostatic method

1 Scope

This document specifies a hydrostatic method for the determination of the apparent density and the open (to water) porosity of carbonaceous products used in the production of aluminium.

This hydrostatic method was developed principally to determine the open porosity but can also be used to measure the apparent density. This document is especially applicable to samples of complex on irregular geometry (due to drilling difficulties).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 8007-1, *Carbonaceous materials used in the production of aluminium — Sampling plans and sampling from individual units — Part 1: Cathode blocks*

ISO 8007-2, *Carbonaceous materials used in the production of aluminium — Sampling plans and sampling from individual units — Part 2: Prebaked anodes*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

The apparent density of a material is defined as the ratio of its dry mass to its volume. The volume is determined by the measurement of the Archimedes force (the mass of the displaced liquid) applied to the sample saturated with water after boiling. The open porosity is simply measured by calculating the ratio of the mass (volume) of water which has penetrated into the sample after boiling to the mass (volume) of the displaced water measured with the hydrostatic balance.

5 Reagents

5.1 Distilled water, or water of equivalent purity.

6 Apparatus

6.1 Heating plates, to hold a beaker containing the samples for boiling.

6.2 Beaker, with a height 2 to 2,5 times the height of the samples.

6.3 Thermometer, for measuring room temperature with a range of 10 °C to 40 °C, and capable of measuring to the nearest 0,5 °C.

6.4 Hydrostatic balance (one plate), capable of measuring to the nearest 0,1 % of the measured mass, for example ± 0,1 g for mass of 100 g.

6.5 Drying cabinet, capable of maintaining a temperature of 110 °C.

7 Sampling

Sample the cathode blocks and baked anodes in accordance with ISO 8007-1 and ISO 8007-2, respectively. Remove any dust or loosely attached pieces which are likely to break off during the test.

To ensure that the sample is mechanically stable during the test, it should not exceed 100 mm in any dimension.

To ensure that the precision given in Clause 9 is achieved, a sample volume of approximately 100 cm^3 is necessary.

8 Procedure

8.1 Determination of dry sample mass

Dry the test specimen at (110 ± 5) °C until constant mass is reached for a minimum of 2 h or until consecutive weightings at 5 min intervals differ by less than 0,1 %. Cool to room temperature in a desiccator and weigh the mass (m_1) of the test specimen to the nearest 0,1 g, if the mass is greater than 100 g, or to the nearest 0,01 g if the mass is 100 g or less.

8.2 Determination of the volume

Place the sample in the beaker (6.2) and fill it with water until the test specimen is covered by 50 mm of water above the top of the test specimen. Place a glass cover on the beaker. Heat the beaker rapidly and allow the water to boil for 1 h. Refill, if necessary, to replace evaporated water then cool to room temperature (20 ± 2) °C.

After placing the hydrostatic balance on the water bath, hang the basket on the balance hook by a wire. Immerse the basket completely. Adjust the balance to zero and put the test specimen in the basket.

Immerse the test specimen completely and read the mass (m_2) over the balance with the same precision as defined in 8.1.

Take the test specimen out of the basket, blot it with a moistened sponge and weigh it rapidly (m_3).