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Manganese ores — Determination of moisture content

Minerais de manganèse — Détermination de l'humidité



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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4299 was prepared by Technical Committee ISO/TC 65, *Manganese and chromium ores*.

This second edition cancels and replaces the first edition (ISO 4299: 1980) of which it constitutes a minor revision.

Annexes A and B form an integral part of this International Standard.

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Manganese ores — Determination of moisture content

1 Scope

This International Standard specifies a method for determining the mean value of the moisture content of a consignment (lot) of manganese ores, whether natural or processed, including concentrates, pellets and agglomerates.

The method is intended to be applied at the places of dispatch and/or acceptance of the ore.

Annex A specifies a method to be used in the case of adhesive or wet manganese ores. Annex B specifies methods of correction for sprinkled water and/or rain-water.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4296-1 : 1984, *Manganese ores — Sampling — Part 1: Increment sampling.*

ISO 4296-2 : 1983, *Manganese ores — Sampling — Part 2: Preparation of samples.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 moisture sample : The sample taken for the determination of moisture content of the consignment or part of the consignment.

3.2 test sample : A sample prepared for moisture determination from each increment, from each sub-sample, or from the gross sample, in accordance with the method specified for the moisture sample.

3.3 test portion : A representative part of a test sample subjected to moisture measurement.

If the entire quantity of a test sample is subjected to moisture measurement, the test sample may also be called "test portion".

4 Principle

Drying of the test portion in an oven at 105 °C and determination of the moisture content, as a percentage by mass, from the initial and dried masses.

5 Apparatus

5.1 Drying pans, made of stainless material (for example, stainless steel or brass), having a smooth surface, free from contamination and capable of accommodating the specified quantity of moisture sample in a layer of thickness less than 30 mm.

5.2 Drying oven, equipped with a temperature-controlling device capable of regulating the temperature at all points in the oven to within ± 5 °C of the desired temperature.

5.3 Weighing device, accurate to at least 0,05 % of the initial mass of a sample.

6 Sampling and samples

Test samples which have been taken in accordance with ISO 4296-1 and prepared in accordance with ISO 4296-2 shall be used. The mass of a test portion in relation to its whole-through sieve size is specified in table 1.

Table 1 — Minimum mass of test portion

Whole-through sieve size of test portion (mm)	Minimum mass of test portion (kg)
22,4	5
10	1

7 Procedure

7.1 Number of moisture measurements

7.1.1 If one gross sample is obtained from the consignment, four test portions shall be prepared. Two of these shall be submitted for the determination of moisture content and the other two test portions shall be reserved as duplicates in case a check determination is required.

7.1.2 If sub-samples or increments from a consignment are not combined into one gross sample, one test portion shall be prepared from each sub-sample or increment and each of these shall be submitted for the determination of moisture content.

NOTE — Samples which have been sieved in water for size determination are not to be used for determination of moisture content.

7.2 Measurement

7.2.1 Weigh a drying pan (5.1) and record its mass.

7.2.2 Spread the test portion (6) to a thickness of less than 30 mm in the tared drying pan (5.1) and weigh. Record the total mass and the initial mass of the test portion.

7.2.3 Place the drying pan with the test portion in the drying oven (5.2) set at 105 °C and maintain at this temperature for not less than 4 h.

7.2.4 Remove the drying pan with the test portion from the oven and weigh immediately while still hot.

NOTE — The weighing device (5.3) should be protected from the effects of the hot material by a suitable heat-resisting material.

7.2.5 Replace the drying pan with the test portion in the drying oven, heat for a further 1 h, and repeat the weighing.

7.2.6 Repeat the procedure described in 7.2.5 until the difference in mass between subsequent measurements becomes 0,05 % or less of the initial mass of the test portion. If, after repeated drying, the mass increases, the mass measured before the last weighing shall be used.

7.2.7 The moisture content of adhesive or wet ores shall be determined by the method specified in annex A unless the mass of the sample is small, in which case the entire mass of the sample may be dried to determine the moisture content using the procedure described above.

8 Calculation and expression of results

8.1 Moisture content of each test portion

The moisture content, w_i , expressed as a percentage by mass, shall be calculated from equation (1) and reported to the second decimal place :

$$w_i = \frac{m_1 - m_2}{m_1} \times 100 \quad \dots (1)$$

where

m_1 is the initial mass, in grams, of the test portion;

m_2 is the mass, in grams, of the test portion after drying.

8.2 Moisture content of the consignment

The moisture content of the consignment, $\bar{w}$, expressed as a percentage by mass, shall be calculated from one of the equations (2) to (5), as appropriate, and reported to the second decimal place.

8.2.1 When the moisture determination is conducted on a gross sample from the consignment, the moisture content, as a percentage by mass, shall be calculated from the arithmetic mean of the two results obtained from the two test portions as given by the equation

$$\bar{w} = \frac{w_1 + w_2}{2} \quad \dots (2)$$

where

w_1 and w_2 are the moisture contents, as a percentage by mass, of test portions 1 and 2 respectively.

8.2.2 When the moisture determination is conducted on each sub-sample, the moisture content, as a percentage by mass, shall be calculated from the weighted mean of the results for all sub-samples considering the number of increments in each sub-sample as given by the equation

$$\bar{w} = \frac{\sum_{i=1}^k N_i w_i}{\sum_{i=1}^k N_i} \quad \dots (3)$$

where

k is the number of sub-samples;

N_i is the number of increments in the i th sub-sample;

w_i is the result of moisture determination, as a percentage by mass, of the i th sub-sample (test portion).

NOTE — If it is impracticable to sample the consignment as a whole or desirable to sample a consignment in separate parts of unequal mass as in the case of time-basis sampling, the moisture content of each part should be determined independently and the weighted mean of moisture content of the consignment calculated from the individual results as given by the equation

$$\bar{w} = \frac{\sum_{i=1}^k m_i w_i}{\sum_{i=1}^k m_i} \quad \dots (4)$$