SLOVENSKI STANDARD
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Manganove in kromove rude ï Eksperimentalne metode za preverjanje natanļ nosti doloļ anja vlaģnosti

Manganese and chromium ores -- Experimental methods for checking the precision of moisture determination

Minerais de manganèse et de chrome -- Méthodes expérimentales de contrôle de la fidélité de la détermination de l'humidité

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ICS:

73.060.20 Manganove rude Manganese ores

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International Standard 8531

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Manganese and chromium ores — Experimental methods for checking the precision of moisture determination

Minerais de manganèse et de chrome — Méthodes expérimentales de contrôle de la fidélité de la détermination de l'humidité

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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.

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 8531 was prepared by Technical Committee ISO/TC 65, *Manganese and chromium ores*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Manganese and chromium ores — Experimental methods for checking the precision of moisture determination

1 Scope and field of application

This International Standard specifies experimental methods to be applied for checking the precision of moisture determination of manganese and chromium ores, whether natural or processed, being carried out in accordance with the methods specified in the relevant International Standards.

NOTE — An outline of the method for determination of permissible tolerance for duplicate moisture determinations on gross samples is given in the annex.

2 References

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

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

ISO 4299, *Manganese ores — Determination of moisture content.*

3 General conditions

3.1 The sampling, preparation of moisture samples and moisture determination shall be carried out in accordance with the methods specified in the relevant International Standards.

3.2 The mass and number of increments of a sample for the purposes of experiment shall be determined by applying the relevant requirements given in ISO 4296/1, for manganese ores, and in a future International Standard, for chromium ores.

3.3 The levels of moisture content shall be as those given in the table of precision of ISO 4299 for manganese ores, and in a future International Standard for chromium ores.

3.4 The experiment shall be repeated at least 10 times for any level of moisture content.

3.5 The average moisture content of a consignment obtained by this experiment shall be the moisture content of the consignment for commercial purposes.

4 Experimental method

4.1 Sampling procedure

A pair of gross samples, or subsamples each of which consists of the number of increments of a specified mass as determined according to the requirements specified in ISO 4296/1, for manganese ores, and in a future International Standard, for chromium ores, shall be constituted for a consignment.

4.2 Preparation of experimental samples

A pair of final moisture samples shall be prepared from each of the respective gross samples. The preparation of these two sets of samples shall be carried out separately.

4.3 Preparation of final moisture samples

4.3.1 The particle size and mass of the final moisture sample for coarse ores shall be minus 22,4 mm and 5 kg or minus 10,0 mm and 1 kg.

NOTE — Any reduction in sample size or mass of a moisture sample should be carried out with extreme caution to prevent loss of moisture.

4.3.2 The particle size and mass of the final moisture sample for fine ores shall be minus 10,0 mm and 1 kg. See the figure for processes of moisture experiment, as an example.

4.4 Apparatus and procedure of moisture testing

The requirements for apparatus and procedure of moisture testing shall be as specified in ISO 4299 for manganese ores, and in a future International Standard for chromium ores.

4.5 Data sheet

It is recommended that the experimental data be recorded on a data sheet, such as that given in the table.

5 Analysis of experimental data

The analysis of experimental data shall be conducted on each of the levels of moisture content.

5.1 Combined precision of division and measurement [1)]

The estimated value of combined precision of division and measurement in terms of standard deviation shall be calculated from the equations

$$\bar{R}_1 = \frac{1}{2r}\left(\sum |x_{i11} - x_{i12}| + \sum |x_{i21} - x_{i22}| \right) \quad \ldots (1)$$

$$\hat{\sigma}_{DM} = \bar{R}_1 / d_2 \quad \ldots (2)$$

where

x_{i11}; x_{i12}; x_{i21}; x_{i22} are the individual measurements of the two different paired samples of the ith experiment;

r is the number of experiments ($r \geqslant 10$);

$\bar{R}_1$ is the mean range of both of the ranges of the two different duplicate measurements;

$\hat{\sigma}_{DM}$ is the estimated value of combined precision of division and measurement in terms of standard deviation;

d_2 is a factor for obtaining the standard deviation from range ($d_2 = 1{,}128$ for duplicate measurements).

5.2 Precision of sampling and moisture content of the consignment

5.2.1 The estimated value of precision of sampling in terms of standard deviation shall be calculated from the equations

$$\left.\begin{aligned} \bar{x}_{i1.} &= \frac{1}{2}(x_{i11} + x_{i12}) \\ \bar{x}_{i2.} &= \frac{1}{2}(x_{i21} + x_{i22}) \end{aligned}\right\} \quad \ldots (3)$$

$$\bar{R}_2 = \frac{1}{r} \sum |\bar{x}_{i1.} - \bar{x}_{i2.}| \quad \ldots (4)$$

$$\hat{\sigma}_{SDM} = \bar{R}_2 / d_2 \quad \ldots (4a)$$

$$\hat{\sigma}_S = \sqrt{\hat{\sigma}^2_{SDM} - \frac{\hat{\sigma}^2_{DM}}{2}} \quad \ldots (5)$$

where

$\bar{x}_{i1.}$, $\bar{x}_{i2.}$ are the respective mean values of the duplicate measurements of the ith experiment;

$\bar{R}_2$ is the mean of the ranges $R_2(|\bar{x}_{i1.} - \bar{x}_{i2.}|)$;

$\hat{\sigma}_S$ is the estimated value of precision of sampling in terms of standard deviation;

$\hat{\sigma}_{SDM}$ is the estimated value of the overall precision of sampling, division and measurement.

5.2.2 The moisture content of the ith consignment subjected to experiment shall be the overall average of moisture content measurements (denoted $\bar{\bar{x}}_i$) obtained from the equation

$$\bar{\bar{x}}_i = \frac{1}{2}(\bar{x}_{i1.} + \bar{x}_{i2.}) \quad \ldots (6)$$

5.3 Calculation of two-sigma precision

5.3.1 Calculate the estimated value of two-sigma combined precision of division and measurement, $\hat{\beta}_{DM}$, from the result obtained from equation (2)

$$\hat{\beta}_{DM} = 2\hat{\sigma}_{DM} \quad \ldots (7)$$

5.3.2 Calculate the estimated value of two-sigma precision of sampling, $\hat{\beta}_S$, from the result obtained from equation (5)

$$\hat{\beta}_S = 2\hat{\sigma}_S \quad \ldots (8)$$

5.3.3 Calculate the estimated value of two-sigma overall precision, $\hat{\beta}_{SDM}$, from the result obtained from equation (4a). In this case the results of two replications of moisture content measurement that meet the requirements of permissible tolerance given in the relevant International Standard shall be applied.

$$\hat{\beta}_{SDM} = 2\hat{\sigma}_{SDM} \quad \ldots (9)$$

6 Review of experimental results

6.1 When any one or all of the values of $\hat{\beta}_{DM}$, $\hat{\beta}_S$ and $\hat{\beta}_{SDM}$ obtained from the results of this experiment are substantially large in comparison with the specified value of β_{DM}, β_S and β_{SDM} given in the relevant International Standards, before any actions are taken on the procedures of routine operations, inspection shall be made as to whether there was recognizable evaporation of moisture in the experimental samples.

6.2 In the event that the control of experimental operations is found to be adequate but the $\hat{\sigma}_S$ or $\hat{\sigma}_{DM}$ is substantially large, the contents of operational instructions regarding the methods for sampling and sample preparation shall be reviewed in the light of the requirements of the relevant International Standards. If deficiencies are found, consideration shall be given to revision work.

6.3 With respect to actions to be taken on the revision work for the operational instructions and on changes of the procedures of routine operations, prudent decisions shall be made by including

a) examination of the appropriateness of selection of crusher to be used for preparation of the final moisture samples; and

b) a statistical analysis of correlation between level of moisture content of the consignment and combined precision of division and measurement of the sample.

1) Source: ASTM. *ASTM Manual on Quality Control of Materials*. Philadelphia, PA, American Society for Testing and Materials, 1951.

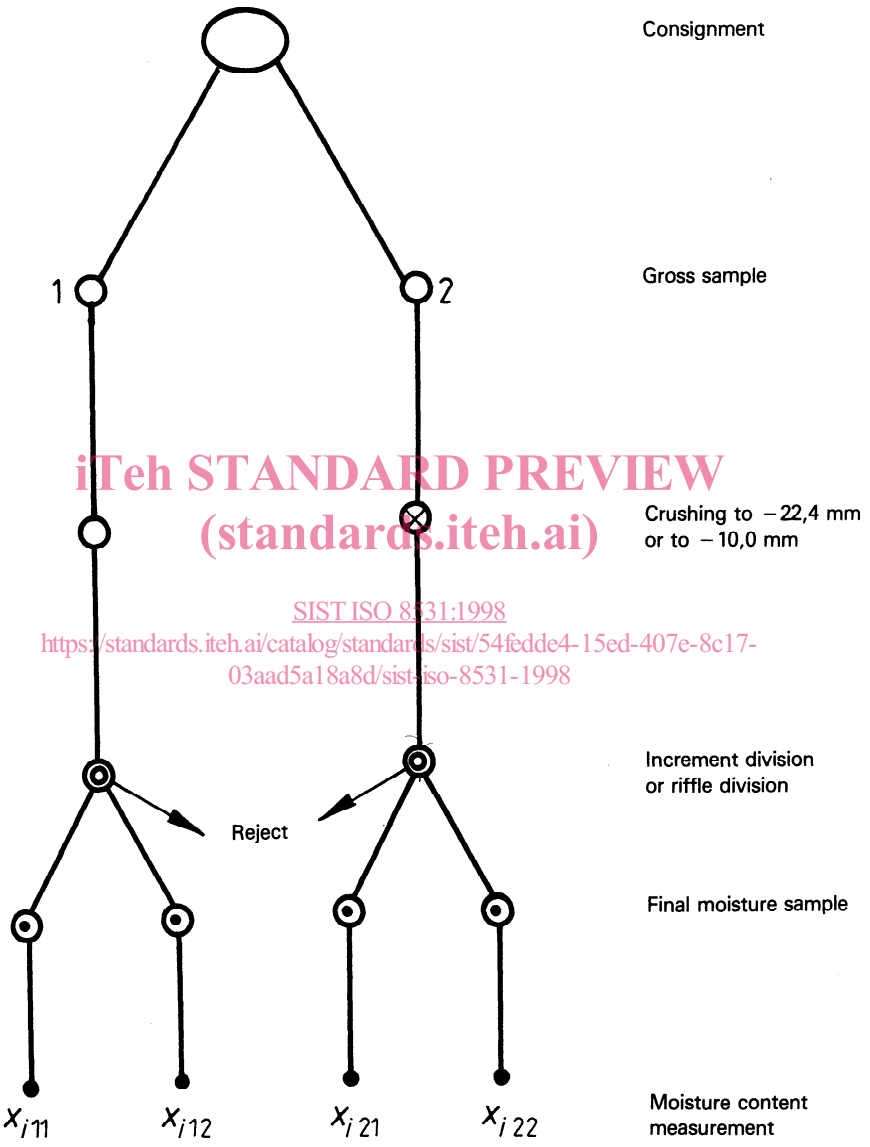

Figure — Flow sheet for processes of moisture experiment (example)

Table — Data sheet for moisture experiment (example)

Designation of experiment:

Type of ore: (for example manganese ore)

Level of moisture content:

Dates of experiment:

Consignment No.	Name of ore	Mass of consignment (t)	Maximum particle size (mm)	Mass of increment (kg)	Number of increments
1. 2. . . . 10.					

Consignment No.	Gross sample 1				Gross sample 2					
	x_{i11}	x_{i12}	$\bar{x}_{i1.}$	R_1	x_{i21}	x_{i22}	$\bar{x}_{i2.}$	R_1	$\bar{\bar{x}}_i$	R_2
1. 2. . . . 10.										

Calculation

$\hat{\sigma}_{SDM} = \bar{R}_2/1{,}128 =$ .....

$\hat{\sigma}_{DM} = \bar{R}_1/1{,}128 =$ .....

$$\hat{\sigma}_S = \sqrt{\hat{\sigma}^2_{SDM} - \frac{\hat{\sigma}^2_{DM}}{2}} = \text{.....}$$