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Aluminium ores — Experimental determination of the heterogeneity of constitution

Minerais alumineux — Détermination expérimentale de l'hétérogénéité de constitution

Reference number
ISO 6138:1991(E)

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.

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.

International Standard ISO 6138 was prepared by Technical Committee ISO/TC 129, *Aluminium ores*, Sub-Committee SC 1, *Sampling*.

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Aluminium ores — Experimental determination of the heterogeneity of constitution

1 Scope

This International Standard specifies an experimental method for determining the heterogeneity of constitution which is required for the determination of the minimum sample mass.

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 indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6140:1991[1], *Aluminium ores — Preparation of samples.*

ISO 8685:—[1], *Aluminium ores — Sampling procedures.*

3 Definitions

For the purposes of this International Standard, the definitions in ISO 8685 and the following apply.

3.1 heterogeneity of constitution: Measure of the variation in quality characteristic between particles of an ore.

4 Estimation of the heterogeneity of constitution

4.1 General

An aluminium ore may be composed of particles of the same qualitative nature which are themselves homogeneous, or of a mixture of particles of different compositions. This results in heterogeneity of constitution which is quantified as the coefficient of variation of the quality characteristics between individual particles.

The heterogeneity of constitution is usually much greater when the particle size is coarser and always much greater when there is a larger variation in content between particles. To allow a quantitative evaluation, the procedure described in this International Standard needs to be carried out on a sample which is representative of the ore lot.

4.2 Estimation of the between-particle coefficient of variation

The heterogeneity of constitution shall be determined for five particle size ranges, because it directly affects the mass of the increments. The procedure is as follows:

a) Assemble in a column, a set of 10 sieves with decreasing aperture sizes covering, between the greatest and smallest mesh size, 95 % of the particle size distribution of the sample.

b) Sieve the whole sample through the 10 sieves. Discard the material passing through the finest sieve.

c) Weigh each of the 10 particle size fractions.

1) To be published.

d) Combine adjacent particle size fractions to obtain five groups with masses which are as equal as possible.

e) Select from each of the five groups, 10 aliquots of approximately equal masses (see table 1).

f) Finely grind each group of n particles ($\varnothing$ < 0,15 mm) and analyse them separately to determine their quality characteristic.

g) Estimate the coefficient of variation for the particle size fractions from the following equation:

$$C_v = \frac{100}{\bar{x}} \sqrt{\frac{n \Sigma (x_i - \bar{x})^2}{9}}$$

where

x_i is the content, in percentage, measured on group i;

$\bar{x}$ is the mean of 10 results (in percentage), hence the number of degrees of freedom is nine;

n is the number of particles per group.

The highest C_v value shall be retained for the calculation of the minimum sample mass, in accordance with ISO 8685 and ISO 6140.

Table 1 — Number of particles or fragments per group

Sieve aperture retaining the sieved fraction $\varnothing$ mm	Approximate mass of aliquot g	Approximate number of particles per group n
63	650	2
45,0	600	5
31,5	320	8
22,4	150	10
16,0	80	15
11,2	35	20
8	20	30
5,60	12	50
4	6	70
2,8	4	140

5 Example of typical calculation

A typical calculation for determining the heterogeneity of constitution of an ore is given in table 2.

The parameter determined is the percentage of alumina (% Al_2O_3) on five sieve fractions.

NOTE 1 The calculations are based on the assumption that ϱ = 2,5 t/m³.

Table 2 — Typical calculation

Test sample No.	Percentage of alumina (% Al_2O_3)				
	+ 9,5 mm	+ 6,7 mm	+ 5,6 mm	+ 4,75 mm	+ 3,35 mm
1	54,84	55,65	55,43	55,48	54,41
2	57,69	56,16	55,97	55,35	54,30
3	56,17	53,61	55,48	55,42	54,72
4	56,22	54,23	56,59	55,19	54,88
5	53,47	55,54	56,10	55,67	54,45
6	52,04	54,53	55,45	55,32	54,79
7	52,89	55,71	55,76	55,33	54,92
8	56,28	54,06	55,54	55,18	54,75
9	55,22	53,97	55,76	55,13	55,02
10	53,35	54,33	56,34	55,70	54,82
Mean	54,82	54,78	55,84	55,38	54,71
σ	1,818	0,895	0,401	0,195	0,239
Sample mass (g)	16,0	38,1	43,7	41,1	51,1
Estimated number of particles	14	97	190	293	1 038
C_v	12,41	16,09	9,90	6,03	14,07

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