International Standard 2325

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Coke — Size analysis (Nominal top size 20 mm or less)

Coke — Analyse granulométrique (Dimension nominale égale ou inférieure à 20 mm*)*

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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 2325 was prepared by Technical Committee ISO/TC 27, *Solid mineral fuels.*

This third edition cancels and replaces the second edition (ISO 2325-1979), of which it constitutes a minor revision.

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.

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Coke — Size analysis (Nominal top size 20 mm or less)

1 Scope and field of application

This International Standard specifies a method of determining the particle size distribution of a sample of coke having a nominal top size of 20 mm or less. Two methods of operation are described :

a) where a restricted size analysis is required, using two sieves only;

b) where a complete size analysis is required.

2 References

ISO 565, *Test sieves — Woven metal wire cloth, perforated plate and electroformed sheet — Nominal sizes of openings.*

ISO 579, *Coke — Determination of total moisture.*

ISO 1953, *Hard coals — Size analysis.*

ISO 2309, *Coke — Sampling.*

ISO 2591, *Test sieving.*

ISO 3310, *Test sieves — Technical requirements and testing*

— *Part 1 : Test sieves of metal wire cloth.*

— *Part 2 : Test sieves of metal perforated plate.*

3 Principle

A sample of coke is subjected to a process of size analysis by a specified procedure, and the results are expressed in terms of the cumulative percentage by mass of the coke remaining on sieves of different sized openings.

4 Apparatus

4.1 Perforated plate sieves, of round opening size respectively 20 mm and 10 mm.

4.2 Wire cloth test sieves, of the following opening sizes :

16, 8, 4, 2 and 1 mm;

500, 250, 125 and 63 µm.

These sieves are conveniently shaken by means of an appropriate mechanical shaking machine.

The sieves (4.1 and 4.2) shall comply, when selected and during use, with ISO 565, ISO 3310/1 and ISO 3310/2.

4.3 Lightweight containers, of metal or plastic material, for the sample and the fractions sieved from it. The largest container shall be capable of holding 20 kg of sample.

4.4 Weighing machines, suitable for weighing a mass of up to 30 kg, such that the weighing error does not exceed 0,1 % of the maximum mass of sample or 10 g, whichever is the smaller.

5 Sample

The sample shall be representative of the coke and shall be taken as specified in ISO 2309. For coke containing appreciable quantities (over 20 %) above 10 mm, the mass of the sample shall be 20 kg and the whole of this sample shall be used for size analysis. For samples where the nominal top size is 2,8 mm or less, the mass of sample used for size analysis shall be not less than 0,3 kg and preferably not more than 0,5 kg. This quantity shall be taken from the primary sample using one of the following methods of sample division :

— cone divider;

— riffle splitter;

— coning and quartering.

Intermediate masses for the test sample shall be taken according to the nominal top size of the coke.

6 Procedure

6.1 Restricted size analysis on two sieves

Before commencing the test, dry the coke sample at a temperature of 200 °C (see ISO 579).

Weigh the sample to the nearest 10 g. Place the two sieves (4.1) or two of the sieves (4.2) one above the other in a suitable frame, with the sieve of larger opening size uppermost. Place the receiving tray below the sieve of smaller opening.

Transfer a quantity of the dry coke to the upper sieve, such that it is not choked by the coke. In general, this will mean that not more than 75 % of the sieve is covered by the coke. Shake the sieve by hand (see the note) until no more coke passes through the openings. Remove the top sieve, transfer the oversize to a container of known mass, and carry out the same procedure with the coke remaining on the lower sieve. Replace the empty sieves in the frame. Repeat the process until the whole sample has been treated in this manner, transferring the coke to the appropriate containers after each operation.

Weigh each container with its contents to the nearest 10 g and calculate the total mass of coke which remains on each sieve after the sieving operations.

Transfer the coke which has passed through the lower sieve into the tray to a container of known mass, and weigh.

NOTE — Mechanical shaking may be used, provided that its action does not break the coke and that the results are known to be not biased with respect to the results obtained by hand shaking.

6.2 Complete size analysis (using a mechanical sieving machine)

NOTE — Where a mechanical sieving machine is not available, the procedure specified in ISO 1953 should be adopted.

Before commencing the test, dry the coke sample at a temperature of 200 °C (see ISO 579).

Weigh the sample to an accuracy of 0,1 %. It will probably be advisable to carry out the size analysis in two stages if a complete range of openings is to be covered, namely :

— using sieves with 16, 8, 4, 2 and 1 mm openings;

— using sieves with 500, 250, 125 and 63 µm openings.

The diameter of the sieves having openings of 1 mm or more will generally be larger than that of sieves with smaller openings.

When transferring from larger to smaller diameter sieves, it may be necessary to reduce the mass of material to a known proportion and to sieve this known reduced mass on the smaller diameter sieves, repeating the same sieving procedure (see ISO 2591).

Assemble the appropriate sieves in a nest in descending order of size, and fit the receiver. Transfer the sample to the top sieve, fit the lid, and shake the nest of sieves for 5 min.

At the end of this period, clean each sieve in turn, starting with the coarsest mesh sieve, by inverting it over a paper or tray, tapping the side and carefully brushing the uppermost surface of the sieve. Add any loose particles dislodged during brushing to the oversize on the tray or on the paper.

Replace the sieve in the nest, and transfer the material in the tray or on the paper back to the sieve.

Repeat the process of sieving for 5 min, transfer the oversize from each sieve to a container of known mass, adding any material dislodged by brushing, and determine the mass of each fraction.

7 Expression of results

7.1 Calculation

Record the mass of each size fraction. Calculate the cumulative mass on each sieve, starting with the sieve of largest opening.

The apparent loss, i.e. the difference between the total mass of the sample before and after the size analysis, shall be recorded. Loss in mass means loss of sample, and should not occur. If the loss is not more than 1 % of the original sample mass, it shall be added to the mass of the fraction of smallest size. If the loss is greater than 1 % of the original sample mass, the results of the size analysis shall be rejected.

Convert each cumulative mass to a percentage of the total mass.

If the sample of coke has been sub-divided during the size analysis, the results obtained on the sub-samples shall be multiplied by the ratio of the respective masses in order to relate these results to the original sample of coke. The results shall be reported to the nearest 10 g and 0,1 % (m/m).

For all methods of sieving, the arithmetic mean size may be calculated, using the results of the size analysis of the coke in the following way :

sieve openings : $a, b, c, d, \ldots, h, j, k$

cumulative percentages : $A, B, C, D, \ldots, H, J, K$

the symbols being allocated so that $A = 0$ % (m/m) and $K = 100$ % (m/m) (i.e. $k = 0$ mm).

Then

$$\text{mean size} = \frac{1}{200}[B\,(a - c) + C\,(b - d) + \ldots + J\,(h - k) + 100\,j]$$

NOTES

1 This formula is greatly simplified when a sieve series of constant interval is used. It is essential that the openings of the sieves in any series be all round or all square. If openings of 1 mm and above are sufficient for the size analysis, a series with either round or square openings may be used. If openings smaller than 1 mm are necessary, only a series of woven wire sieves with square openings shall be used.

2 Alternative methods of calculation, or graphical methods, may lead to slightly different results; therefore, when comparing test results from different samples, it is important to adhere to the same method of calculation.

7.2 Precision of the method

7.2.1 Repeatability

The results of duplicate determinations of size analysis carried out at different times in the same laboratory, by the same operator, with the same apparatus on samples obtained by taking alternate increments from the same consignment of coke,