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Replacing GB/T 211-2007

Determination of Total Moisture in Coal

(ISO 589:2008, Hard Coal-Determination of Total Moisture, NEQ)

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Foreword

This Standard is drafted in accordance with GB/T 1.1-2009.

This Standard replaces GB/T 211-2007 “Hard Coal - Determination of Total Moisture”. In comparison with GB/T 211-2007, in addition to editorial changes, the main technical content changes are as follows:

— Method C (drying by microwave) is deleted (please refer to 3.3 in Version 2007);

— 13mm sample is added to Method B1 (please refer to 3.2.1 in Version 2007);

— Moisture loss correction of dry air during the sampling is added (please refer to 7.4);

— Informative appendix (determination of total moisture in coal through the method of drying by microwave) is added (please refer to Appendix A).

This Standard is redrafted in accordance with ISO 589:2008 “Hard Coal - Determination of Total Moisture”. The consistent degree between this Standard and ISO 589:2008 is not equivalent.

This Standard was proposed by the China National Coal Association.

This Standard shall be under the jurisdiction of the National Technical Committee on Coal Chemical Industry of Standardization Administration of China.

Drafting organization of this Standard: Coal Analysis and Test Laboratory of China Coal Research Institute.

Chief drafting staffs of this Standard: Zhang Bo, Sun Gang and Li Hongtu.

The previous editions of the standard replaced by this Standard are as follows:

— GB 211-1963, GB 211-1984, GB/T 211-1996 and GB/T 211-2007.

Determination of Total Moisture in Coal

1 Scope

This Standard specifies the method summary, reagent and materials, apparatus, procedures, result calculation, precision and test report for the determination of total moisture in coal.

The method of drying under nitrogen (Method A1 and B1) shall be applicable to all types of coals; the method of drying in air (Method A2 and B2) shall be applicable to bitumite (excluding easily oxidized coal) and blind coal.

Method A1 shall be the arbitration method in this Standard.

Note: the method of drying by microwave that's applicable to the rapid determination of total moisture is also provided in this Standard. The method of drying by microwave is applicable to bitumite and lignite. Please see Appendix A for details.

2 Normative References

The following documents are indispensable in the implementation of this Standard. For the dated references, only the dated versions are applicable to this Standard. For the undated references, the latest edition (including all the amendments) are applicable to this Standard.

GB/T 212 "Proximate Analysis of Coal"

GB 474 "Method for Preparation of Coal Sample"

GB/T 19494.2 "Mechanical Sampling of Coal - Part 2: Method for Sample Preparation"

3 Method Summary

3.1 Method A (two-stage method)

3.1.1 Method A1: drying under nitrogen

Weigh-take a certain amount of 13mm coal samples; dry them in the environment where the temperatures do not exceed 40°C, until the constant mass is reached. Crush the sample into particle size lower than 3mm; dry them under nitrogen at (105~110) °C, until the constant mass is reached. Calculate the total moisture from

with a sufficiently rapid rate of atmosphere change, for instance, more than 5 times per hour.

5.2 Nitrogen-flushed oven: with device for automatic temperature control, capable of being controlled at (105~110)°C, able to accommodate appropriate weighing bottles with a little more room to spare, with inlet and outlet for nitrogen, and allow more than 15 times of atmosphere change per hour.

5.3 Analytical balance: division value is 0.001g.

5.4 Industrial balance: division value is 0.1g.

5.5 Dryer: contain allochronic silica gel or granular anhydrous calcium chloride.

5.6 Flow meter: with a measuring range of (100~1000)mL/min.

5.7 Drying tower: with a volume of 250ml and contain allochronic silica gel or granular anhydrous calcium chloride.

6 Sample

6.1 According to GB 474 or GB/T 19494.2, prepare the sample for total moisture. In which, for 13mm coal sample for total moisture, it shall not be less than 3kg; for 6mm sample for total moisture, it shall not be less than 1.25kg.

6.2 Before determining the total moisture in coal sample, it shall firstly check the sealing condition of the container. Afterwards, clean the surface; weigh the sample with an industrial balance to the nearest 0.1% of its total mass; check the result with the total mass indicated on the label. If there's a loss of mass and it can be ascertained that there is no sample loss during transportation or storage, then the mass reduced shall be regarded as that of the lost moisture. Calculate the percentage of moisture loss and make correction in accordance with what's mentioned in 7.3. If the loss of mass is greater than 1.0%, then, it is not allowed to perform correction of moisture loss; when reporting the results, it shall indicate that "the moisture loss is not corrected" AND report the container label and sealing condition.

6.3 Before weighing-taking the sample, it shall well mix (mixing time is not less than 1 min) the sample.

7 Procedures

7.1 Method A (two-stage method)

7.1.1 Free moisture (Methods A1 and A2, drying in air)

Use a pre-dried and weighed tray to quickly take-weigh 490g~510g (accurate to 0.1g)

two continuous inspections is not more than 0.01g or the mass increases. In the latter case, the mass of the previous inspection shall be adopted as the reference for calculation.

7.2.2 Method B2 (drying in air)

7.2.2.1 Total moisture in 13 mm coal sample

7.2.2.1.1 Use a pre-dried and weighed tray to quickly weigh-take 490g~510g (accurate to 0.1g) of 13 mm coal sample; spread it evenly.

7.2.2.1.2 Put the tray in an air-drying oven which has been preheated to (105~110)°C. Under the condition of air-blowing, for bitumite, dry for 2h; for blind coal, dry for 3h.

7.2.2.1.3 Remove the tray and weigh it (accurate to 0.1g) while it is still hot.

7.2.2.1.4 Conduct drying inspection, 30min each time, until each mass reduction in two continuous inspections is less than 0.5g or the mass increases. In the latter case, the mass of the previous inspection shall be adopted as the reference for calculation.

7.2.2.2 Total moisture of 6mm coal sample

Except that the nitrogen-flushed oven is replaced by the air-drying oven, the procedures are the same as that in 7.2.1.

7.2.3 Result calculation

Total moisture in coal shall be calculated in accordance with Formula (4);

$$M_t = \frac{m_1}{m} \times 100 \qquad \cdots\cdots (4)$$

Where,

M_t — the total moisture in coal sample, %;

m — the mass of weighed coal sample, unit is gram (g);

m_1 — the mass loss after the coal sample is dried, unit is gram (g).

7.3 Moisture loss correction in the sample

If there is a need for moisture correction, the value of corrected total moisture shall be calculated in accordance with Formula (5).

$$M_t' = M_t + \frac{100 - M_t}{100} \times M_t \qquad \cdots\cdots (5)$$