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Replacing YB/T 5189-2007

Determination of the Volatile Matter Content in Carbon Materials

炭素材料挥发分的测定

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Foreword

This Document was drafted as per the rules specified in GB/T 1.1-2020 *Directives for Standardization – Part 1: Rules for the Structure and Drafting of Standardizing Documents*.

This Document replaced YB/T 5189-2007 *Determination of the Volatile Matter Content in Carbon Material*. Compared with YB/T 5189-2007, the major technical changes of this Document are as follows:

a) Change the normative references (see Clause 2 of this Edition; Clause 2 of the 2007 Edition);

b) Add terms and definitions (see Clause 3 of this Edition);

c) Change the temperature control accuracy requirements for the high-temperature furnace in the instrumentation and equipment (see 5.1 of this Edition; 4.1 of the 2007 Edition);

d) Change the size requirements for the specimen passing through the standard sieve (see 6.3 of this Edition; 5.3 of the 2007 Edition);

e) Change the requirements for determining the inherent moisture content in the test procedure (see 7.4 of this Edition; 6.4 of the 2007 Edition);

f) Change the test report (see Clause 10 of this Edition, Clause 9 of the 2007 Edition).

Please note some contents of this Document may involve patents. The issuing agency of this Document shall not assume the responsibility to identify these patents.

This Document was proposed by China Iron and Steel Association.

This Document shall be under the jurisdiction of National Technical Committee on Steel of Standardization Administration of China (SAC/TC 183).

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The historical editions replaced by this Document are as follows:

Determination of the Volatile Matter Content in Carbon Materials

1 Scope

This Document specifies the instrumentation, test procedures, test results, and precision for determination of the volatile matter content in carbon materials.

This Document applies to the determination of volatile matter in the following carbon materials such as calcined coke, calcined coal, needle coke, graphite products, calcined products, and carbon pastes, etc.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 1427 Sample method of carbon material

GB/T 1997 Sampling and preparation of coke specimens

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

GB/T 24527 Carbon materials - Determination moisture in air-dried sample

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 8718-2008 apply.

4 Principle

Under an air-free environment, a specific amount of specimen is heated at a prescribed temperature and for a specified time. The volatile matter content is calculated by determining the difference between the total mass loss and the mass loss due to water evaporation.

5 Instrumentation

5.1 High-temperature furnace: Equipped with an automatic temperature controller to maintain a constant temperature of (900±10) °C, and capable of reheating to (900±10) °C within 3 min after a cold crucible is inserted. The thermocouple hot junction shall be located within the flat-temperature zone of the furnace, 10mm ~ 20mm above the bottom of the furnace. The rear wall of the furnace shall have a small chimney with a diameter of 25mm ~ 30mm.

5.2 Medium-sized porcelain crucible for carbon paste: 25mL capacity, with a lid, outer diameter of top opening 38mm to 39mm, outer diameter of bottom 22mm ~ 25mm, height 37mm ~ 38mm, see Figure 1.

5.3 Double-lid porcelain crucible for other applications: The two lids of the crucible must fit tightly. Outer diameter of top opening 30mm, outer diameter of middle opening 26.3mm, outer diameter of bottom 20.5mm, height 44mm, see Figure 2.

5.4 Analytical balance: Sensitivity of 0.0001g.

5.5 Desiccator: Contains desiccant (color-changing silica gel).

5.6 Crucible holder: Made of welded nickel-alloy wire; the bottom of the crucible shall be 10mm ~ 20mm above the bottom of the furnace.

6 Specimen

6.1 Sample collection as per product type: For carbon paste, graphite products, and calcined products, follow the provisions of GB/T 1427. For other types of bulk or bagged samples, follow the provisions of GB/T 1997.

6.2 Carbon paste specimen: Take the collected specimen with mass of at least 1 kg; crush it to less than 4 mm; reduce the specimen size to approximately 60 g using the quartering method; and grind it so that all particles pass through a 0.5 mm standard sieve.

6.3 Other type of specimen: Take the collected specimen with mass at least 1 kg, dry it at 150°C ± 5°C for 1 h; crush it to less than 4 mm; reduce the specimen size to approximately 60 g using the quartering method; and grind it so that all particles pass through a 0.15 mm standard sieve.

7 Test Procedures

7.1 Carefully mix the prepared specimen to ensure homogeneity. Weigh 2 g of the specimen (3 g for carbon paste), accurate to 0.0001 g. Place it in a pre-weighed, double-lid porcelain crucible that has been heated to constant weight at 900°C ± 10°C (use a medium-sized crucible for carbon paste). Gently tap the crucible to level the specimen, cover it, and place it on the crucible holder.

7.2 Quickly place the crucible holder equipped with crucible into the flat-temperature zone of a high-temperature furnace at 900°C ± 10°C; start the stopwatch to record time at the same time; and close the furnace door fast. Heat for 7 min. Ensure that the furnace temperature returns to 900°C ± 10°C within 3 min after the crucible is placed in; otherwise, the test is invalid.

8 Test Results

The volatile matter content (V_{ad}) of the carbon material specimen is calculated using Formula (1):

$$V_{ad}=\frac{m_2-m_3}{m_2-m_1}\times 100-M_{ad} \qquad \cdots\cdots(1)$$

Where:

V_{ad} – volitale mater content of specimen, mass fraction (%);

m_1 – mass of crucible, in g;

m_2 – mass of crucible and specimen before burning, in g;

m_3 – mass of crucible and specimen after burning, in g;

M_{ad} – mass fraction of moisture in specimen, in %.

The results are calculated as the arithmetic mean of two test results, rounded-off to two digits after the decimal point; and the rounding-off method follows the provisions of GB/T 8170.

9 Repeatability

The test repeatability shall comply with the provision of Table 1.

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