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GB/T 220-2018

Replacing GB/T 220-2001

Determination of Carboxyreactivity of Coal

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Standardization Administration of PRC.

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Foreword

This Standard was drafted as per the rules specified in GB/T 1.1-2009.

This Standard replaced GB/T 220-2001 Determination of Carboxyreactivity of Coal.

Compared with GB/T 220-2001, this Standard has the major technical changes as follows besides the editorial modifications:

--- Add description of the reactivity curve to the “Method Summary” (see Clause 3 of this Edition);

--- Modify the structural representation of the instrument (see Clause 5 of this Edition; Clause 5 of Edition 2001);

--- Add the preparation requirements for the absorption and blocking solutions of the austenitic gas analyzer (see 5.3 of this Edition);

--- Add the Clause “Sample” (see Clause 6 of this Edition);

--- Delete the relationship curve between reduction rate of carbon dioxide and the carbon dioxide content in the gas after reaction (see 8.1 of Edition 2001);

--- Add the Clause “Test Report” (see Clause 11).

This Standard was proposed by China National Coal Association.

This Standard shall be under the jurisdiction of National Technical Committee for Standardization of Coal (SAC/TC 42).

Drafting organization of this Standard: Test Branch of China Coal Research Institute.

Chief drafting staffs of this Standard: Yang Ni, Wu Zengli, Wang Huayang, and Li Yanyan.

The historical editions replaced by this Standard are as follows:

--- GB/T 220-1963, GB/T 220-1977, GB/T 220-1989, GB/T 220-2001.

Determination of Carboxyreactivity of Coal

1 Scope

This Standard specifies the method summary, reagents and materials, apparatus, sample, test preparation, test procedures, result expression, method precision and test report for the determination of carboxyreactivity of coal.

This Standard is applicable to the lignite, bituminous coal, anthracite, and coke.

2 Normative References

The following documents are essential to the application of 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) are applicable to this document.

GB/T 474 Method for the Preparation of Coal Sample

GB/T 483 General Rules for Analytical and Testing Methods of Coal

3 Method Summary

Conduct dry distillation against the coal sample firstly; remove the volatiles (if the sample is coke, no dry distillation is required). Then sieve it, select certain particle size of coke into the reaction tube for heating. After heating to a certain temperature, introduce carbon dioxide with certain flow rate to react with the sample. Determine the content of carbon dioxide in the gas after reaction in the heating process; draw the reaction curve of the temperature – carbon dioxide reduction rate by the volume fraction of the carbon dioxide reduced to carbon monoxide accounting for the volume fraction of the introduced amount of carbon dioxide, namely, carbon dioxide reduction rate α (%).

4 Reagents and Materials

4.1 Sodium hydroxide or potassium hydroxide: chemically pure.

4.2 Sulfuric acid: chemically pure with a relative density of 1.84.

temperature can be controlled at (900±20)°C.

5.4.2 Retorting tube: the porcelain tube or corundum tube with temperature resistance no less than 1000°C; length is 550mm~660mm; inner diameter is 30mm; outer diameter is 33mm~35mm.

5.5 Thermocouple

The platinum rhodium$_{10}$ – one platinum thermocouple and one nickel chromium-nickel silicon thermocouple.

5.6 Thermowell

Two corundum tubes with length of 500mm~600mm, inner diameter of 5mm~6mm; outer diameter of 7mm~8mm.

5.7 Round sieve

It is equipped with sieve bottom and cover with diameter of 200mm, hole diameter of 3mm and 6mm.

5.8 Air pressure gauge

The measurement range is 799.9hPa~1066.6hPa; accuracy of 0.13hPa; minimum division value of 1.33hPa; working temperature of -15°C~45°C.

6 Sample

Prepare about 300g of sample with particle size of 3mm~6mm as per the provisions of GB/T 474.

7 Test Preparation

7.1 Sample processing

7.1.1 Secure the thermowell in the retorting tube with a rubber stopper; make its top at the center of retorting tube. Straighten the retorting tube; add broken corundum pieces or broken porcelain pieces till the top of the thermowell exposed the porcelain pieces about 100mm; then add sample till the sample thickness reaches 200mm; finally use the broken corundum pieces or broken porcelain pieces to fill the rest part of the retorting tube.

7.1.2 Place the sample-filled retorting tube into the tubular retorting furnace; make the sample part in the constant temperature zone; insert the nickel chromium-nickel

the thermowell is placed at the center of the reaction furnace constant temperature zone against the reaction tube. Straighten the reaction tube; add broken corundum pieces or broken porcelain pieces till the top of the thermocouple exposed about 50mm of the broken corundum pieces or broken porcelain pieces.

8 Test Procedures

8.1 Add the sample with particle size of 3mm~6mm after retorting into the reaction tube; the sample layer height is 100mm; place the top of the thermowell at the center of the sample layer; then use the broken corundum pieces or broken porcelain pieces to fill the rest parts of the reaction tube.

8.2 Insert the sample-filled reaction tube into the reaction furnace; use the rubber stopper with discharge tube to plug the upper end of the reaction tube; insert the platinum rhodium$_{10}$-platinum thermocouple into the thermowell till its hot junction touches the top of the thermowell.

8.3 Inject the carbon dioxide, check the air tightness of the entire reaction measurement device; continue to inject carbon dioxide for 2min~3min if without leaking; then stop injecting the carbon dioxide.

8.4 Turn on the power, raise the temperature at the speed of 20°Cmin~25°C/min; raise the furnace temperature to 750°C(lignite) or 800°C(bituminous coal, anthracite and coke) within about 30min; maintain such temperature for 5min. Observe the air pressure gauge, record the air pressure value. When the air pressure value is (1013.3±13.3)hPa, room temperature is 12°C~28°C, inject the carbon dioxide with the flow rate of 500mL/min; if the air pressure value and room temperature deviate from the above range, adjust the gas flow rate as per the Appendix A.

NTOE: (1013.3±13.3)hPa is equivalent to (760±10)mmHg.

8.5 If using the austenitic gas analyzer, when injecting gas for 2.5min, pump the system and take the gas within 1min; stop injecting the carbon dioxide; analyze the volume fraction of carbon dioxide in the gas sample. If using online carbon dioxide gas analyzer, record the volume fraction of carbon dioxide shown by the instrument when injecting the carbon dioxide for 3min.

8.6 While using the austenitic gas analyzer to analyze the gas sample, or using the online carbon dioxide gas analyzer to read the volume fraction of the carbon dioxide; then continue to raise the temperature at the speed of 20°C/min~25°C/min. Maintain the temperature ever raising 50°C as per the 8.4 and 8.5; inject and take the gas to analyze the volume fraction of carbon dioxide in the gas after the reaction at each temperature till the temperature reaches 1100°C.

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