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ICS 73.040

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NATIONAL STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 30733-2014

Determination of total carbon, hydrogen and nitrogen content in coal - Instrumental method

煤中碳氢氮的测定 仪器法

(ISO 29541: 2010, Solid mineral fuels -- Determination of total carbon, hydrogen and nitrogen content -- Instrumental method, MOD)

Issued on: June 09, 2014 **Implemented on: October 01, 2014**

Issued by: **General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China;**

Standardization Administration of the People's Republic of China.

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Foreword

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

This Standard uses re-drafting method to modify and adopt ISO 29541:2010 *Solid Mineral Fuels -- Determination of Total Carbon, Hydrogen and Nitrogen Content -- Instrumental Method*.

Compared with ISO 29541:2010, there is some adjustment in the structure. Annex A lists out the comparison of chapter and article number between this Standard and ISO 29541:2010.

Compared with the ISO 29541:2010, there are technical differences; the involved clauses of differences have been marked with single vertical line (|) along the lateral margin. Annex B shows a list of the corresponding technical differences and their reasons.

This Standard was proposed by China National Coal Association.

The standard shall be centralized by SAC/TC 42, National Coal Standardization Technical Committee of China.

Drafting organizations of this Standard: Branch of China Coal Research Institute, Shenhua Trading Group Limited, and Changsha Kaiyuan Instruments Co., Ltd.

Main drafters of this Standard: Pi Zhongyuan, Li Ting, Zhang Quanjun, Wen Sheng, and Zhou Yongwang.

Determination of total carbon, hydrogen and nitrogen content in coal - Instrumental method

1 Scope

This Standard specifies the method summary, reagents and materials, instrument and equipment, determination, calibration, results statement, accuracy etc. of determining carbon, hydrogen and nitrogen in the coal by instrumental method. This Standard applies to quick determination of carbon, hydrogen and nitrogen in lignite, bituminous coal and anthracite.

2 Normative references

The articles contained in the following documents have become this Standard when they are quoted herein. For the dated documents so quoted, all the modifications (excluding corrections) or revisions made thereafter shall not be applicable to this Standard. For the undated documents so quoted, the latest editions shall be applicable to this Standard.

GB/T 212 Proximate analysis of coal

GB/T 218 Determination of carbon dioxide content in the mineral carbonates associated with coal

GB/T 483 General rules for analytical and testing methods of coal

3 Method summary

A coal sample with known weight burns sufficiently in high temperature and oxygen flow. The carbon, hydrogen and nitrogen in the coal can form carbon dioxide, water and nitrogen/nitrogen oxide mixture. A specific disposal system is used to filter the factors which affect the determination (e.g. sulfur, chlorine and other products of combustion), and reduce the nitrogen oxide into nitrogen. The content of carbon, hydrogen and nitrogen in the coal is quantitative determined by a specific detection system in the form of carbon dioxide, water vapor and nitrogen.

4 Reagents and materials

4.1 Carrier gas: Choose the helium specified by the instrument’s instructions or other suitable gas.

problems. Calibrate the instrument according to 7.2 when necessary. Determine the tested values which have already be done before the check. The calibration check is recommended at the beginning and at the end of each lot of samples. The calibration check shall be conducted after every 10 times of sample determinations during the determination.

8 Results expression

8.1 Calculation of the hydrogen content in the coal

Calculation of the hydrogen content in the coal is calculated in accordance with the Formula (1).

$$H_{ad} = H_{t,ad} - 0.111\ 9M_{ad} \qquad \cdots\cdots(1)$$

Where:

H_{ad}-- The hydrogen content in the coal is valued by mass fraction (%);

$H_{t,ad}$-- The total hydrogen content measured by instrument is valued by mass fraction (%);

M_{ad}-- The air-dried moisture content in the coal sample (determined by GB/T 212) is valued by mass fraction (%).

8.2 Calculation of the organic carbon content in the coal

When determination of the organic carbon ($C_{o,ad}$) is necessary, calculate it in accordance with the Formula (2).

$$C_{o,ad} = C_{ad} - 0.272\ 9(CO_2)_{ad} \qquad \cdots\cdots(2)$$

Where:

$C_{o,ad}$-- The organic carbon content in the coal is valued by mass fraction (%);

C_{ad}-- The total organic carbon content measured by instrument is valued by mass fraction (%);

$(CO_2)_{ad}$-- The content of carbon dioxide in carbonate (determined by GB/T 218) is valued by mass fraction (%).

8.3 Results expression

The carbon, hydrogen and nitrogen content (valued by mass fraction, %) of the sample is reported according to the average value after determined twice, accurate to 0.01% according to GB/T 483.

Annex C
(Informative)
Examples of instrument calibration method

C.1 Determine the content range of carbon, hydrogen and nitrogen in the daily determined coal. Determine the quantity of coal sample according to the instrument specification. Calculate the content range of the calibration material according to Formula (C.1). If choosing pure substance as the calibration substance, then take its metering data as the standard values; if choosing certified coal standard substance as the calibration substance, then convert the standard values to the air-dry basis value.

$$m_{standard} = \frac{m \cdot x}{X_{standard}} \qquad \text{.....(C.1)}$$

Where:

$m_{standard}$ -- The unit of the sample weight of the calibration material, g;

m -- The unit of the sample weight specified in the instrument specification, g;

X-- Measurement range (%) of each element content;

$X_{standard}$ -- Standard value (%) of standard substance.

If choosing single-point calibration, then:

$$m_{standard} = m \qquad \text{.....(C.2)}$$

C.2 Examples:

the carbon content range of the daily determined coal sample is 40.00%~70.00%; the hydrogen content range is 3.00%~4.00%; the nitrogen content range is 0.60%~1.00%. The specified sample weight in the instrument specification is 80mg. Choose EDTA as the calibration material to fit the calibration curve of carbon and hydrogen. And choose the certified coal standard substance as the calibration material to fit the calibration curve of the nitrogen. EDTA's measuring value is carbon: 41.098%; Hydrogen: 5.518%. The standard values of the certified coal standard substance is nitrogen: 0.82%.

Calculate it according to Formula C.1:

When fitting the carbon calibration curve, calculation of EDTA sample weight range is:

$$m_{C40\%} = \frac{80 \times 40}{41.098} \approx 78 \text{ mg}, m_{C70\%} = \frac{80 \times 70}{41.098} \approx 136 \text{ mg};$$

When fitting the hydrogen calibration curve, calculation of EDTA sample weight range is:

$$m_{H3\%} = \frac{80 \times 3}{5.518} \approx 43 \text{ mg}, m_{H4\%} = \frac{80 \times 4}{5.518} \approx 58 \text{ mg};$$

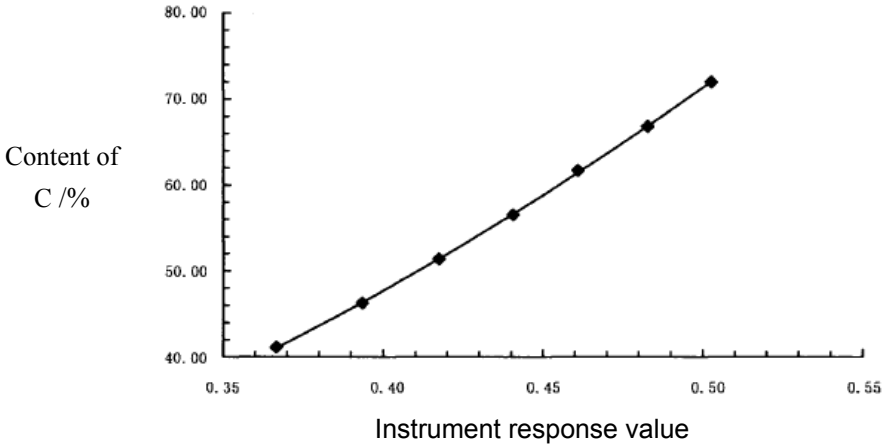

Figure C.1 Carbon standard curve

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