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Coal — Determination of carboxyreactivity

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National foreword

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 27, *Coal and Coke,* Subcommittee SC 5, *Methods of analysis*.

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Introduction

Coal gasification is an important technology for clean coal conversion, which involves many factors. The chemical reactivity of coal is one of the essential parameters for the gasification industry and its relevant coal trade.

The chemical reactivity of coal with CO_2 (carboxyreactivity of coal) is a measurement of the coal's ability to reduce CO_2 to CO, which is an important parameter of evaluating the coal quality for gasification and combustion industry. The level of carboxyreactivity of coal is directly related to other characteristics of the coal in the gasification or combustion furnace like the reactive extent, the reaction speed and efficiency, the consumption of coal and oxygen, the effective compositions of the coal gas, so it is not only used for evaluating the applicability of coal for gasification, combustion, indirect liquefaction, etc., but also for guiding users to select coal used for above technologies.

This document integrates and modifies GB/T 220[2] to specify a method for determining the reactivity of coal with carbon dioxide (carboxyreactivity). It can also be applied to determine the reactivity of coke for the purpose of gasification and combustion.

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Coal — Determination of carboxyreactivity

1 Scope

This document specifies the method for determining the reactivity of coal with carbon dioxide (carboxyreactivity). It can be applied to determine the reactivity of coke for the purpose of gasification and combustion.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1213-2, *Solid mineral fuels — Vocabulary — Part 2: Terms relating to sampling, testing and analysis*

ISO 18283, *Coal and coke — Manual sampling*

ISO 13909-4, *Hard coal and coke — Mechanical sampling — Part 4: Coal — Preparation of test samples*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1213-2 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Principle

A coal sample with the size fraction of 3 mm to 6 mm is carbonized in a dry distillation furnace to remove the volatile matter (this is not necessary for coke samples). Sieve and collect a portion of the carbonized products (coke residue) with the designated size. Put them into the reaction tube and heat to the specified rates. When the required temperature is achieved, pass CO_2 gas through the reaction tube at a uniform flow rate. Determine the volume fraction of residual CO_2 in the gases by a gas analyser at the specified time of passing CO_2 gas. Calculate the ratio α (%) of CO_2 gas being reduced to CO and take it as the index of the carboxyreactivity at the specified temperature.

5 Reagents

Unless otherwise specified, all reagents shall be of analytical reagent grade, and only distilled water, or water of equivalent purity, shall be used.

5.1 Anhydrous calcium chloride.

5.2 Sulfuric acid, relative density, ρ = 1,84.

5.3 Potassium hydroxide or sodium hydroxide solution, 500 g/l.

Dissolve 50 g of potassium hydroxide or sodium hydroxide in 100 ml of distilled water.

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