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Coke — Determination of coke reactivity index (CRI) and coke strength after reaction (CSR)

Coke — Détermination de l'indice de réactivité du coke (CRI) et de la résistance post-réactionelle du coke (CSR)

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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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, *Solid mineral fuels*, Subcommittee SC 3, *Coke*.

This second edition cancels and replaces the first edition (ISO 18894:2006), which has been technically revised.

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Coke — Determination of coke reactivity index (CRI) and coke strength after reaction (CSR)

1 Scope

This document specifies the equipment and techniques used for determining lump-coke (nominal top size >20 mm) reactivity in carbon dioxide gas at elevated temperatures and its strength after reaction in carbon dioxide gas by tumbling in a cylindrical chamber.

Main application is the testing of coke to be used in iron making blast furnaces (CRI~ < 33, CSR~ > 55). This standard can also be applied to other coke types (e.g. foundry coke), but limited precision is to be expected. Application to coke for non-iron making blast furnaces is beyond the scope of this document.

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 579, *Coke — Determination of total moisture*

ISO 3310 (all parts), *Test sieves — Technical requirements and testing*

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

ISO 13909-5, *Hard coal and coke — Mechanical sampling — Part 5: Coke — Sampling from moving streams*

ISO 13909-6, *Hard coal and coke — Mechanical sampling — Part 6: Coke — Preparation of test samples*

ISO 18283, *Hard coal and coke — Manual sampling*

IEC 60584-1, *Thermocouples — Part 1: EMF specifications and tolerances*

IEC 60584-3, *Thermocouples — Part 3: Extension and compensating cables — Tolerances and identification system*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1213-2 and the following 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 http://www.electropedia.org/

3.1
abrasion value
lack of resistance to abrasion of the coke after reaction with carbon dioxide in the CRI test, measured as the percentage of a sample passing through a 0,5 mm sieve after tumbling under conditions specified in this document

Note 1 to entry: See Annex D.

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3.2
coke reactivity index
CRI
percentage weight loss of coke after reaction with carbon dioxide to form carbon monoxide under conditions specified in this document

3.3
coke strength after reaction
CSR
strength of coke after reaction with carbon dioxide in the CRI test, measured as the percentage retained on either a 10,0 mm or a 9,5 mm sieve after tumbling under conditions specified in this document

4 Principle

A test portion of the dried coke sample having a size range from 19,0 mm to 22,4 mm is heated in a reaction vessel to 1 100 °C in a nitrogen atmosphere. For the test, the atmosphere is changed to carbon dioxide for exactly 2 h. After the test, the reaction vessel is allowed to cool down to about 50 °C in a nitrogen atmosphere. The comparison of the sample weight before and after the reaction determines the coke reactivity index (CRI).

The reacted coke is treated in a specially designed tumbler for 600 revolutions for 30 min. The coke strength after reaction (CSR) value is determined by sieving and weighing the amount of coke passing through either a 10,0 mm or a 9,5 mm sieve.

An example of the arrangement of the test unit is shown in Figure 1.

NOTE During the development of this document, it was found that 10,0 mm and 9,5 mm sieves are both commonly used for these types of test. When reacted coke is tumbled, abrasion usually takes place. Particles of about 20 mm lose some edges, but they do not break into pieces. Therefore, it makes almost no difference if the sieving after tumbling is made with a 10,0 mm or a 9,5 mm sieve, as the size of the coke pieces is either about 20 mm or 0 mm to 5 mm, but not in the range of 10 mm. This has been verified by experiments over a long period of time. It has been shown that the difference in CSR using both sieve sizes is within the precision range of this document.

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