

CCS Q 40



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 5990-2021

**Refractory materials - Determination of thermal conductivity,
specific heat capacity and thermal diffusivity(hot-wire method)**

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Table of Contents

Foreword

1 Scope

2 Normative references

3 Terms and definitions

Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1. Structure and Drafting Rules of Standardization Documents"

Drafting.

This document replaces GB/T 5990-2006 "Test Method for Thermal Conductivity of Refractories (Hot Wire Method)", and is similar to GB/T 5990-2006

In addition to structural adjustments and editorial changes, the main technical changes are as follows.

- a) The scope of the document has been changed (see Chapter 1, Chapter 1 of the.2006 edition);
- b) The requirements of "Equipment", "Sample", "Test Procedure" and "Result Calculation" of "Cross Hot Wire Method" are changed (see 4.2~4.6,.2006 edition 4.2~4.6);
- c) The size of the test block is changed (see 4.4.3, 5.4.3, 4.4.4, 5.4.3 of the.2006 edition);
- d) Delete the "data processing" of the "Cross Hot Wire Method" (see 4.7 in the.2006 edition); add the "Precision" of the "Cross Hot Wire Method" (See 4.7);
- e) The principle expression of the "parallel hotline method" is changed (see 5.1, 5.1 of the.2006 edition);
- f) The test temperature deviation of the "parallel hot wire method" is changed (see 5.2.1, 5.2.1 of the.2006 edition);
- g) Changed the power requirement of the "parallel hot wire method" that can supply the hot wire (see 5.2.3, 5.2.3 of the.2006 edition);
- h) The temperature measurement accuracy requirements in the time resolution of the

"parallel hot wire method" are changed (see 5.2.6, 5.2.6 of the.2006 edition);

i) The sampling requirements of the "parallel hot wire method" samples are changed (see 5.3.1, 5.3.1 of the.2006 edition);

j) The sample size requirements of the "parallel hot wire method" have been added (see 5.3.2.2);

k) The expression of "parallel hot wire method" surface flatness has been changed (see 5.3.3, 5.3.3 of the.2006 edition);

l) The position requirements for the grooves of the "parallel hot wire method" dense materials have been changed (see 5.3.4, 5.3.4 of the.2006 edition);

m) Modified the description of part of the test procedure of the "parallel hot wire method" (see 5.4.1, 5.4.2, 5.4.3, 5.4.1 of the.2006 edition

5.4.2, 5.4.3), deleted the time t measurement accuracy (see 5.4.5, Table 1,.2006 version 5.4.5, Table 1), changed the push of Table 1

Recommended power (see Table 1, Table 1 of the.2006 edition);

n) The requirement for the thermal conductivity test results of the "parallel hot wire method" has been added (see 5.5.1.2);

o) Added "parallel hot wire method" thermal diffusivity, specific heat capacity and test results rounding (see 5.5.2, 5.5.3, 5.5.4);

p) Changed the description of the test report [see Chapter 6 a), Chapter 6 a) of the.2006 edition];

q) The example of the thermal conductivity of the "parallel hot wire method" and the query source of the thermoelectromotive force of various types of thermocouples have been changed (see Appendix D,.2006)

Version appendix B), added "parallel hot wire method" specific heat capacity and thermal diffusivity examples (see Appendix D).

This document uses the redrafting method to amend and adopt ISO 8894-1.2010 "Test Method for Thermal Conductivity of Refractory Materials Part 1.Thermal

Wire Method (Cross Hot Wire Method and Platinum Resistance Thermometer Method)" and ISO 8894-2.2007 "Test Method for Thermal Conductivity of Refractory Materials Part 2.

Hot wire method (parallel hot wire method).

Compared with ISO 8894-1.2010 and ISO 8894-2.2007, this document has more structural adjustments. This document is listed in Appendix A

List of comparisons between documents and corresponding ISO document chapter

numbers.

Compared with ISO 8894-1.2010 and ISO 8894-2.2007, this document has technical differences, and the clauses involved in these differences have been adopted.

The vertical single line (|) in the margin position on the outer margin is marked, and the corresponding technical differences and one of the reasons are given in Appendix B.

List.

This document has made the following editorial changes.

---The name of the standard has been changed;

---Deleted Appendix A and Appendix B of ISO 8894-1.2010.

1 Scope

This document describes the determination of the thermal conductivity of refractories by the cross hot-wire method and the parallel hot-wire method for the determination of the thermal conductivity and thermal expansion of refractories.

Test method for dispersion coefficient and specific heat capacity.

The cross hot wire method is suitable for measuring temperature not greater than 1250 degrees C, thermal conductivity less than 1.5W/(m.K), thermal diffusivity not greater than $5 \times 10^{-6} \text{ m}^2/\text{s}$ non-carbon refractory material.

The parallel hot wire method is suitable for measuring non-conductive refractory materials whose temperature is not more than 1250 degrees C and the thermal conductivity is less than 25W/(m.K).

This document also applies to powdered and granular refractories.

Note 1. The thermal conductivity of unfired bricks and unshaped refractory preforms is affected by the dehydration of the residual water after hardening or solidification during heating, and the sample can be pre-treated

reason. The method, degree of pretreatment and the holding time of the sample during temperature measurement are beyond the scope of this document and are agreed upon by both parties.

Note 2. It is generally difficult to measure heterogeneous materials, especially fiber-containing materials. The measurement of such materials using this method is agreed upon by both parties.

2 Normative references

The contents of the following documents constitute the indispensable clauses of this

document through normative references in the text. Among them, dated quotations

Only the version corresponding to that date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

This document.

GB/T 4513.5 Unshaped refractory materials Part 5. Sample preparation and pretreatment (GB/T 4513.5-2017, ISO 1927-

5.2012, MOD)

GB/T 8170 Numerical rounding rules and the expression and determination of limit values

GB/T 10325 Sampling inspection rules for acceptance of shaped refractory products (GB/T 10325-2012, ISO 5022.1979, NEQ)

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Thermal conductivity

The amount of heat transferred through a unit area of a material in a unit temperature gradient along a heat flow direction in a unit time.

Note. The unit is watts per meter Kelvin [W/(m.K)].

3.2

Thermal diffusivity thermal diffusivity

The ratio of the thermal conductivity of a material to its heat capacity per unit volume.

Note. The unit is square meters per second (m²/s).

3.3

Specific heat capacity

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