

ICS 13.220.40



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

GB/T 14402-2007

**Reaction to fire tests for building materials and products --
Determination of the heat of combustion
(English Translation)**

Issued on: March 31, 2026

Implemented on: October 1, 2026

Issued by: State Administration for Market Regulation

Table of Contents

Foreword...	4
1 Scope...	7
2 Normative References...	7
3 Terms and Definitions...	7
4 Principle...	9
5 Test Device...	10
5.1 General Rules...	10
5.2 Oxygen Bomb Calorimeter...	10
5.3 Timer...	12
5.4 Power Supply...	12
5.5 Pressure Gauge and Needle Valve...	12
5.6 Balance...	12
5.7 "Cigarette" Preparation Device...	12
5.8 Tablet Press...	14
6 Reagents and Materials...	14
6.1 Water...	14
6.2 High-pressure Oxygen...	14
6.3 Benzoic Acid Tablets or Powder...	15
6.4 Combustion Aid...	15
6.5 Cigarette Paper...	15
6.6 Cotton Thread...	15
6.7 Ignition Wire...	15
7 Specimen...	15
7.1 General Rules...	15
7.2 Specimen Preparation...	16
7.3 Surface Density Determination...	16
7.4 Grinding...	17
7.5 Selection of Test Method...	17
7.6 Conditioning...	17
7.7 Specimen Quantity...	17
7.8 Mass Determination...	17
7.9 Test by the Crucible Method...	18

7.10 Test by the Cigarette Method.....	18
--	----

1 Scope

This document describes a method for determining the gross heat of combustion (QPCS) of materials and products in a constant-volume oxygen bomb calorimeter.

This document applies to the determination of the heat of combustion of solid materials.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of dated references, only the version with the specified date applies to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 30733 Determination of Total Carbon, Hydrogen and Nitrogen Content in Coal - Instrumental Method

GB/T 40238 Reaction to Fire Test for Building Materials and Products - General Rules for Selection of Substrates, Conditioning and Mounting of Specimen

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1

material

A single substance or a mixture of uniformly dispersed substances.

EXAMPLE. stone, wood, concrete, uniformly dispersed mineral wool, polymers.

3.2

product

Material, component or element for which relevant information is required.

3.3

homogeneous product

A product made of a single material or having a uniform density and composition.

3.4

non-homogeneous product

A product that does not meet the definition of a homogeneous product and is composed of

The heat generated by the complete combustion of a unit mass of material, provided that all water produced by combustion condenses into a liquid state.

NOTE 1: the unit is megajoules per kilogram (MJ/kg).

NOTE 2: the abbreviation PCS comes from the French definition of "pouvoir calorifique supérieur".

3.11

net heat of combustion

QPCI

The heat generated by the complete combustion of a unit mass of material, provided that all water produced by combustion is in a gaseous state.

NOTE 1: net heat of combustion is calculated from gross heat of combustion.

NOTE 2: the unit is megajoules per kilogram (MJ/kg).

NOTE 3: the abbreviation PCI comes from the French definition of "pouvoir calorifique inférieur".

3.12

latent heat of vaporization of water

The heat required to convert water from a liquid to a gaseous state.

NOTE: the unit is megajoules per kilogram (MJ/kg).

3.13

surface density

The mass per unit area.

NOTE: the unit is kilograms per square meter (kg/m²).

4 Principle

This method involves placing a specimen of a certain mass inside a calorimetric bomb filled with high-pressure oxygen, allowing it to completely combust. The heat released during combustion causes the water bath temperature inside the calorimeter to rise through heat conduction. By measuring the water temperature rise, in combination with system heat loss and the correction of the latent heat of vaporization of water, the heat of combination of the specimen is finally calculated.

This method is used to measure the absolute heat of combustion of materials and products,

regardless of their combustion morphology.

5.1 General Rules

The test device (oxygen bomb calorimeter) is shown in Figure 1. See 5.2 for detailed description.

Other equipment shall comply with the provisions of 5.3 ~ 5.8.

Figure 1 -- Oxygen Bomb Calorimeter

5.2.1 Calorimetric bomb

The calorimetric bomb shall meet the following conditions.

- a) Volume of (300 ± 50) mL;
- b) Mass not exceeding 3.25 kg;
- c) Bomb bucket thickness not less than 1/10 of the bomb bucket's inner diameter.

The calorimetric bomb cover is used to accommodate the crucible and electronic ignition device.

The calorimetric bomb cover and all sealing devices shall be able to withstand an internal pressure of at least 21 MPa.

NOTE: the calorimetric bomb described above can withstand the maximum pressure generated by the combustion of 1 g of coal under an initial oxygen pressure not exceeding 3 MPa (by the gauge method). The device has been verified to meet safety standards and does not require additional weight to improve safety.

The inner wall of the bomb bucket shall be corrosion-resistant, especially when testing materials like sulfur, and shall be able to withstand pitting and intergranular corrosion caused by acidic substances produced during combustion.

5.2.2 Outer cylinder of calorimeter

The outer cylinder of the calorimeter shall be a double-walled container with an insulated cover.

The outer cylinder shall be filled with water, and the gap between it and the inner cylinder shall be at least 10 mm. The inner cylinder shall be secured with an insulating material having the smallest possible contact area, preferably using a three-point support system.

For the adiabatic calorimetry system, the heater and temperature measurement system shall be integrated and installed inside the cylinder to ensure that the water temperature in the outer and inner cylinders is the same.

For the isothermal calorimetry system, the water temperature in the outer cylinder shall be