

ICS 81.080



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

GB/T 2999-2025

**Refractory materials - Determination of bulk density of granular
materials**

(English Translation)

Issued on: August 1, 2025

Implemented on: February 1, 2026

Issued by: State Administration for Market Regulation

Table of Contents

Foreword...	3
1 Scope...	5
2 Normative References...	5
3 Terms and Definitions...	5
4 Principle...	6
5 Sampling...	6
6 Specimens...	6
7 Determination of the Mass (m ₁) of Dry Specimens...	6
8 Determination of Bulk Density of Specimens - Method 1.Weighing Method...	6
9 Determination of Bulk Density of Specimens - Method 2.Burette Method...	10
10 Rounding of Values...	11
11 Allowable Errors...	11
12 Test Report...	12

1 Scope

This document describes two methods for determining the bulk density of granular refractory materials with a particle size greater than 2.0 mm.

---Method 1.weighing method;

---Method 2.burette method.

Method 1 serves as the arbitration method.

This document applies to the determination of the bulk density of granular refractory 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 references with a specified date, only versions with a specified date are applicable 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 2997 Test Method for Bulk Density, Apparent Porosity and True Porosity of Dense

Shaped Refractory Products (GB/T 2997-2015, ISO 5017.2013, MOD)

GB/T 6005 Test Sieves - Metal Wire Cloth, Perforated Metal Plate and Electroformed Sheet

-

Nominal Sizes of Openings (GB/T 6005-2008, ISO 565.1990, MOD)

GB/T 8170 Rules of Rounding off for Numerical Values & Expression and Judgement of
Limiting Values

GB/T 17617 Rule of Sampling and Inspection for Refractory Raw Materials (GB/T
17617-2018,

ISO 8656-1.1988, MOD)

GB/T 18930 Terminology for Refractories (GB/T 18930-2020, ISO 836.2001, MOD)

3 Terms and Definitions

The terms and definitions defined in GB/T 18930 are applicable to this document.

4 Principle

By weighing the mass of the dry specimen, the mass of the saturated specimen suspended in the immersion liquid, and the mass of the saturated specimen, calculate the bulk density of the specimen; or by weighing the mass of the dry specimen and determining the specimen volume using the burette method, calculate the bulk density.

5 Sampling

Take laboratory samples from the product in accordance with the sampling scheme specified in

GB/T 17617 or agreed upon by relevant parties.

6.1 Specimen Preparation

Take representative specimens from the laboratory sample as specified. After crushing, sieve (particles smaller than 5.0 mm may be directly sieved), until all specimens pass through a test sieve with a 5.0 mm aperture (8.1.1). In addition, discard particles smaller than 2.0 mm. Place the specimens on the test sieve (8.1.1) and use water to wash them or blow air (for water- sensitive specimens) to remove dust or loose particles adhering to the surface.

6.2 Number of Specimens

Use the quartering method to reduce the dried granular specimens to 200 g ~ 500 g for testing.

7 Determination of the Mass (m₁) of Dry Specimens

Place the specimen in an electric drying oven (8.1.2) at 110 °C ± 5 °C and dry it to a constant mass, i.e., dry it, until the difference in mass between the last two weighings is no more than

0.1%. Allow it to naturally cool to room temperature in a desiccator (8.1.3). Use a balance (8.1.4), weigh-take two parallel specimens from the dried specimen, each weighing 40 g ~ 60 g, accurate to 0.01 g.

NOTE: for special materials, dry them at the specified temperature.

8 Determination of Bulk Density of Specimens - Method 1.

Weighing Method

8.1 Equipment

8.1.1

Test sieve. conforming to the provisions of GB/T 6005, with apertures of 2.0 mm and 5.0 mm, and equipped with a sieve bottom and sieve cover.

8.1.2

Electric drying oven. temperature control accuracy of 110 °C ± 5 °C.

8.1.3

Desiccator.

8.1.4

Balance. with a division value of 0.01 g.

8.1.5

Non-absorbent fiber cloth, such as polyester and nylon fiber cloth.

8.1.6

Immersion tank.

8.1.7

Vacuumizing device. capable of reducing the absolute pressure to no more than 2,500 Pa and measuring the absolute pressure.

8.1.8

Immersion liquid. for materials that do not react with water, the immersion liquid shall be pure water. For materials that are susceptible to hydration reaction in contact with water, kerosene or other suitable organic liquids shall be used. The immersion liquid shall be stable at an absolute pressure higher than that used in the test. If the immersion liquid becomes contaminated or flocculent, it shall be promptly replaced.

8.1.9

Basket with netting on top. a basket with a handle, made with a mesh with an aperture of 1 mm.

8.1.10 Container with overflow tube. with an appropriate size to accommodate the specimen

when determining the mass of a saturated specimen suspended in the immersion liquid.

8.1.11 Cotton gauze. approximately 60 cm x 60 cm in size.

8.1.12 Weighing bottle. 60 mm in diameter, 30 mm in height.

8.1.13 Hydrostatic balance or hydrometer. with a division value of 0.001 g/cm³.

8.2 Specimen Immersion

Carefully place the weighed specimen (m_1) on a non-absorbent fiber cloth (8.1.5), use a string to securely wrap it, and place it in an immersion tank (8.1.6). Place the tank in a vacuumizing device (8.1.7) and evacuate it to an absolute pressure of less than 2,500 Pa. Maintain the specimen at this vacuum level for 5 minutes. Then, disconnect the immersion tank from the vacuum pump. If the specimen in the immersion tank no longer degasses and the pressure no longer increases, re-connect the immersion tank to the vacuum pump and start injecting the immersion liquid. Within 3 minutes, fill the tank, until the immersion liquid covers the specimen by approximately 20 mm. Maintain this pressure for approximately 5 minutes, then, turn off the vacuum pump, remove the immersion tank, and allow it to rest in air for 30 minutes. Throughout the immersion process, the specimen shall remain covered by the immersion liquid, until it is removed and weighed.

8.3 Determination of the Mass (m_2) of Saturated Specimens Suspended in the

.....