

YB

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

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**Dense refractory castables. Determination of bulk density and
apparent porosity
(English Translation)**

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1 Subject content and scope of application

This standard specifies the definition, determination principle, equipment, specimens, test steps, result calculation, test error of bulk density and apparent porosity of dense refractory castables.

This standard is applicable to the determination of bulk density and apparent porosity of dense refractory castables after drying and firing.

2 Normative references

GB 8170 Rules for rounding off of numerical values GB 7321 Rule of preparing sample for tests of dense shaped refractory products YB/T 5202 Dense refractory castables - Evaluation of consistency test and preparation of test-pieces YB/T 5203 Dense refractory castables - Determination of linear change

3.1 Total volume V_b . The sum of the volumes of solid materials, open pores, closed

pores in porous materials, which is expressed as the volume enclosed by the outer surface of the specimen.

3.2 Open pores. Pores in the specimen that can be filled with water or impregnation

liquid.

3.3 Bulk density D_b . The ratio of the mass of a porous material to the total volume, expressed in g/cm³.

3.4 Apparent porosity P_a . The ratio of the volume of all open pores in a porous material

to the total volume, expressed as a percentage.

4 Principle

4.1

Ruler measuring method. Weigh the dry mass of the specimen. Measure the length, width, height of the rectangular specimen. Calculate the total volume and bulk density.

4.2

Hydrostatic weighing method. Weigh the dry mass of the specimen. Determine the specimen volume by the hydrostatic weighing method. Calculate the apparent porosity.

It can also be used to determine the bulk density.

5.1 Electric drying oven

5.2 Pan balance. The maximum load is 5000 g; the sensitivity is 1 g.

5.3 Industrial balance. The maximum load is 1000 g; the sensitivity is 0.05 g.

5.4 Vernier caliper. The graduation value is 0.05 mm.

5.5 Vacuum device. Ensure that the residual pressure is not greater than 2.5 kPa.

5.6 Container with overflow pipe.

5.7 Dryer with desiccant.

5.8 Towel.

6.1 Number of specimens

Each group of specimens shall be 5 pieces, which is not less than 3 pieces.

6.2 Specimen shape and size

6.2.1

The following rectangular samples can be used for the ruler measuring method.

Type A. 230 mm x 114 mm x 65 mm;

Type B. 230 mm x 65 mm x 54 mm;

Type C. 160 mm x 40 mm x 40 mm.

6.2.2

The specimen for the liquid static weighing method is cut from the type A, type B or type C specimen, which has a volume of 100 ~ 200 cm³; the ratio of the longest side to the shortest side shall not exceed 2.1.

6.3 Specimen cutting position

Refer to GB 7321.

6.4 Specimen calcination

It is carried out according to Article 6.3 of YB/T 5203.

6.5 Specimen appearance

The specimen for the ruler measuring method shall have a flat surface and complete edges and corners. The specimen for the liquid static weighing method shall have no visible cracks, a flat surface, and no particle falling.

7.1.1 Before weighing, the fine particles adhering to the surface of the specimen shall

be brushed clean; it is dried in an electric drying oven at 110 ± 5 °C for 2 h or dried to a constant weight at the temperature specified in the relevant product technical conditions (see note); moved into a dryer to cool naturally to room temperature.

Note: The sample is dried at 110 ± 5 °C for 1 h, and the difference between the two weighing before and after is not greater than 0.1% of its mass, which is the constant weight.

7.1.2 Weigh the mass m of the specimen for the ruler method with a pan balance, accurate to 1 g.

7.1.3 Weigh the mass m_1 of the specimen for the hydrostatic weighing method with a

balance, accurate to 0.05 g.

7.2 Specimen size measurement

Measure the length l , width b , height h of the specimen at four points in the middle of each edge of the specimen, accurate to 0.05 mm. Calculate the total volume V_b of the specimen by the arithmetic mean of the four measurements.

7.3 Specimen immersion

Put the specimen in a container. Place it in a vacuum device. Evacuate it, until the residual pressure is less than 2.5 kPa. Keep constant pressure for 15 min. Then slowly inject the immersion liquid within 5 min according to the following requirements, until the specimen is completely submerged.

Inject industrial water into hydraulic refractory castables; inject industrial pure organic liquid into air-hardening refractory castables.