

Methods of testing

Refractory materials —

Part 3: General and textural
properties —

Section 3.16 Determination of pore size
distribution (method 1902-316)

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Committees responsible for this British Standard

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- British Ceramic Research Ltd.
- British Steel Industry
- Electricity Supply Industry in England and Wales
- Engineering Equipment and Materials Users' Association
- Refractories Association of Great Britain
- Refractory Contractors' Association
- Society of Glass Technology

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Designation	1
3 Definitions	1
4 Principle	1
5 Apparatus	2
6 Test samples	2
7 Procedure	3
8 Calculation of results	6
9 Test report	7
Figure 1 — General arrangements of coarse and fine pore measuring devices illustrating two methods of detecting the mercury level in the capillary	4
Figure 2 — Schematic arrangement of sample holder	5
Table 1 — Examples of ways of presenting results	6
Table 2 — Density of mercury	7
Publications referred to	Inside back cover

Foreword

This Section of BS 1902-3 has been prepared under the direction of the Refractory Products Standards Policy Committee. The method is based on measurement of pore size distribution by mercury intrusion.

As very high pressures are used in the determination and small volumes of mercury are measured, it is more convenient to use a commercially available apparatus than to construct one to comply with this method. The manufacturers' operating manuals give details of how their apparatus is to be used.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

NOTE This Section is to be used in conjunction with BS 1902-3.0 "Introduction" and BS 1902-3.1 "Guidance on sampling". Section 3.0 shows the general arrangement of BS 1902 and lists the Sections of Part 3.

1 Scope

This Section of BS 1902-3 describes a method for the measurement of pore size distributions of solid and granular refractory material. The method can be used to measure pore diameters in the approximate range $0.006\ \mu\text{m}$ to $600\ \mu\text{m}$.

NOTE 1 The assumed model in this method has all the pores parallel sided and of circular cross section; the results are reported as equivalent pore diameters. A model for pores of different cross section, e.g. elliptical, can be derived by making appropriate adjustments to the mathematics.

NOTE 2 This method is unsuitable for materials that:

- a) contain volatile compounds which give off vapours when placed under vacuum;
- b) contain metals that amalgamate with mercury.

NOTE 3 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Designation

The method of determining pore size distribution described in this Section is referred to by the following designation.

Method 1902-316.

3 Definitions

For the purposes of this Section of BS 1902 the following definitions apply.

3.1 item

the brick, or bag of granular raw material, which is to be tested

3.2 test sample

the portion of sample on which pore size measurements are made, in the form of a cut piece of brick or of granular particles

3.3 equivalent pore diameter

the diameter of a pore at a given pressure which represents the pores of irregular cross section impregnated by mercury at that pressure

3.4 ink bottle pores

non-parallel sided pores in the form of an ink bottle with a narrow neck and a wide body, measured as if the whole pore was of the same diameter as the neck

3.5 coarse pores

pores with diameters greater than or equal to $10\ \mu\text{m}$, whose equivalent diameters are measured with the coarse pore measuring device

3.6 fine pores

pores with diameters less than $10\ \mu\text{m}$ whose equivalent diameters are measured with the fine pore measuring device

3.7 mercury filling device

apparatus which is made so that only fine pores can be measured, employed to evacuate and fill the sample holder with mercury

3.8 coarse pore measuring device

an apparatus for measuring the proportion of coarse pores present in a sample, combining the functions of mercury filler and pore measurer

3.9 fine pore measuring device

an apparatus for measuring the proportion of fine pores present in a sample

3.10 apparent solid density

the ratio of the mass of the material to its apparent solid volume, which is the volume of the solid material plus the volume of the closed pores

4 Principle

A test sample is placed in a vessel which is evacuated and filled with mercury. The pressure on the mercury is increased to force it into progressively finer pores and measurement of the volume of mercury forced into the pores at different pressures enables the pore size distribution to be determined. The data obtained can also be used to calculate the apparent porosity, bulk density, and apparent solid density of the test sample (see 8.4).