STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
Methods for Physical Testing of Refractories and Refractory Materials

AS 1774.5—1979
THE DETERMINATION OF DENSITY, POROSITY AND WATER ABSORPTION

5.1 SCOPE. This standard sets out the evacuation method and the boiling water method for determining the following properties of a refractory:

(a) Bulk density.

(b) Apparent solid density.

(c) Apparent porosity.

(d) Water absorption.

In addition it sets out a method for determining bulk density by direct measurement of mass and volume and provides formulas from which, after determining true density by AS 1774.6, the following may be calculated:

(i) True porosity.

(ii) Sealed porosity.

5.2 APPLICATION. The evacuation method (Clause 5.4) is applicable to all refractories. The boiling water method (Clause 5.5) is applicable only to refractories which are unaffected by boiling water and shall not be used when the resistance to boiling water is in doubt.

The direct measurement method for determining bulk density (Clause 5.6) is applicable only to regular shaped specimens having a volume of at least 1000 cm^3. It is appropriate for use in the field or plant.

5.3 DEFINITIONS. For the purpose of this standard, the following definitions apply:

5.3.1 Volume.

Bulk volume—the volume of the solid material plus the volume of the sealed and open pores.

Apparent solid volume—the volume of the solid material plus the volume of the sealed pores.

True volume—the volume of the solid material only.

5.3.2 Density.

Bulk density (D_b)—the ratio of the mass of a material to its bulk volume.

Apparent solid density (D_{as})—the ratio of the mass of a material to its apparent solid volume.

True density (D_t)—the ratio of the mass of a material to its true volume.

5.3.3 Porosity.

Apparent porosity (P_a)—the ratio of the volume of the open pores to the bulk volume, expressed as a percentage.

True porosity (P_t)—the ratio of the volume of the open and sealed pores to the bulk volume, expressed as a percentage.

Sealed porosity (P_s)—the ratio of the volume of the sealed pores to the bulk volume, expressed as a percentage.

5.3.4 Water absorption (A_w)—the ratio of the mass of absorbed water to the mass of the dry specimen, expressed as a percentage.

5.4 EVACUATION METHOD.

5.4.1 Test Specimen. The test specimen shall be of one piece which may be either cut or broken from the sample material, provided that the test specimen has a volume of at least 200 cm^3. It shall have at least one cut or broken face, and the area of original face material shall be at least 50 percent of the total area. Friable edges shall be removed by grinding, and any loose particles removed prior to testing.

5.4.2 Apparatus. The following apparatus is required:

(a) *Drying oven.* A drying oven capable of being controlled within the range 105°C to 110°C.

(b) *Balance.* A balance with an accuracy of ±0.1 g. The balance shall have attached to its hook a loop of fine nylon or a suitable non-absorbent saddle to enable a specimen to be suspended and covered with liquid during immersion weighing.

(c) *Vacuum vessel.* A vessel equipped with two inlets, one to introduce the immersion liquid and the other for maintaining the vacuum while the immersion liquid is being admitted.

ISBN 0 7262 1753 0
C