Australian Standard®

Refractories and refractory materials—Physical test methods

Method 24: Resistance to thermal shock

PREFACE

This Standard was prepared by the Standards Australia Committee on Refractories and Refractory Materials, as a revision of AS 1774.24—1989, *Methods for physical testing of refractories and refractory materials,* Method 24: *Resistance to thermal shock.*

The objective of this revision is to align the test with current practice.

The major change from the previous edition is the removal of the need to achieve a specified temperature on the rear face, with consequent changes to the apparatus.

CONTENTS

METHOD

1 SCOPE This Standard describes a procedure for determining the resistance to thermal shock of a refractory when a face is exposed to specified temperature fluctuations in a prescribed manner.

This Standard is applicable to all dense, prefired refractories that—

(a) are chemically stable in an oxidizing atmosphere;

(b) when tested in accordance with AS 1774.3 have a modulus of rupture not less than 2 MPa; and

(c) are large enough for test specimens of the required dimensions to be cut.

NOTE: The thermal shock conditions specified in this Standard may not be severe enough for testing special refractories such as silicon carbides.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS
1774 Refractories and refractory materials—Physical test methods
1774.3 Method 3: Determination of cold modulus of rupture
1774.13 Method 13: Permanent dimensional change

2243 Safety in laboratories

2780 Refractories and refractory materials—Glossary of terms

3 DEFINITIONS For the purpose of this Standard, the definitions given in AS 2780 and those below apply.

3.1 Thermal shock—a rapid change in temperature that may contribute to cracking or spalling.

NOTE: The temperature change may typically be several hundreds of degrees Celsius in a matter of minutes.

3.2 Thermal shock resistance—the ability of a refractory to withstand sudden heating or cooling without deterioration of its mechanical strength or its structural integrity.

4 PRINCIPLE A refractory test specimen of specified dimensions is subjected to thermal shock by exposure to prescribed heating and cooling through a selected face. The modulus of rupture is then determined on the specimen and is compared with that of an untested specimen cut from the same brick. The percentage retained strength (*PRS*) is calculated and reported as a measure of the specimen's resistance to thermal shock.

5 SAFETY This Standard may involve hazardous materials, operations and equipment. This Standard does not purport to address the safety problems associated with its use. It is the responsibility of the user of this Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Reference should be made to relevant parts of AS 2243.

6 APPARATUS

6.1 General description The apparatus shall consist of a furnace, a movable test panel assembly (see Figure 1), a cooling fan, temperature measuring and recording equipment, and apparatus specified in AS 1774.3 for conducting the modulus of rupture test.

6.2 Furnace

6.2.1 *Opening* The furnace shall be designed so that it has an opening of sufficient dimensions to permit a snug fit of the test panel assembly (6.3) in the opening. The face of the panel shall be flush with the interior wall of the furnace, thereby exposing the panel face to the heating conditions in the furnace, while shielding any exposed part of the steel housing. The fit of test panel in the opening shall be such as to permit its ready removal and replacement during the cooling and reheating periods described in Clause 8.1, Steps (g) to (i).

6.2.2 *Heating capability* The heating capability of the furnace shall be such that it can raise the temperature of the hot face of a test panel from ambient conditions to 1000°C in approximately 2 h. Furthermore, from the time the test panel has been placed in position (after having been cooled in accordance with Clause 8.1(g)), the furnace shall be capable of raising the temperature of the test face to 1000°C in no more than 10 min.