



Designation: **C416 – 97 (Reapproved 2013) C416 – 97 (Reapproved 2018)**

## Standard Classification of Silica Refractory Brick<sup>1</sup>

This standard is issued under the fixed designation C416; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This classification is limited to silica brick meeting the following requirements:

~~Alumina ( $\text{Al}_2\text{O}_3$ ) content of less than 1.50 %.~~

~~Titania ( $\text{TiO}_2$ ) content of less than 0.20 %.~~

~~Iron oxide ( $\text{FeO}_3$ ) content of less than 2.50 %.~~

~~Calcium oxide ( $\text{CaO}$ ) content of less than 4.00 %.~~

~~Average modulus of rupture of not less than 500 psi (3.45 MPa).~~

1.1.1 Alumina ( $\text{Al}_2\text{O}_3$ ) content of less than 1.50 %.

1.1.2 Titania ( $\text{TiO}_2$ ) content of less than 0.20 %.

1.1.3 Iron oxide ( $\text{FeO}_3$ ) content of less than 2.50 %.

1.1.4 Calcium oxide ( $\text{CaO}$ ) content of less than 4.00 %.

1.1.5 Average modulus of rupture of not less than 500 psi (3.45 MPa).

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate ~~safety~~ safety, health, and ~~health~~ environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 ASTM Standards:<sup>2</sup>

**C133 Test Methods for Cold Crushing Strength and Modulus of Rupture of Refractories**

NOTE 1—Chemical analysis of refractory products is determined by a combination of ~~x-ray~~ X-ray fluorescence (XRF) and inductively coupled ~~plasma~~ plasma (ICP) using standard reference materials (SRM), including various types of minerals and refractory materials that are available from the National Institute of Standards and Technology<sup>3</sup> and other appropriate sources.

### 3. Significance and Use

3.1 The presence of certain impurities in silica brick tends to lower their refractoriness and service limits. This classification permits those familiar with refractories to predict the refractoriness of silica brick from their alkali and alumina contents.

### 4. Basis of Classification

4.1 ~~Flux Factor—Silica~~ **Flux Factor**—Silica brick are classified on the basis of impurities by the use of a “flux factor,” which is equal to the percent of alumina plus twice the percent of total alkalis.

4.2 ~~Types:~~ **Types:**

4.2.1 **Type A**—Silica brick having a flux factor of 0.50 or less.

4.2.2 **Type B**—All other silica brick falling within the scope of this classification.

<sup>1</sup> This classification is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.92 on The Joseph E. Kopanda Subcommittee for Editorial, Terminology and Classification.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

## 5. Test Methods

5.1 The properties listed in this classification shall be determined in accordance with the following ASTM methods:

5.1.1 *Modulus of Rupture*—Test Method ~~Methods~~ **C133**.

5.1.2 *Chemical Analysis*—XRF and ICP.

## 6. Retests

6.1 Because of variables resulting from sampling and the lack of satisfactory reproducibility in tests conducted by different laboratories, the material may be resampled and retested when requested by either the manufacturer or the purchaser. This may apply in instances when the first test results do not conform to the requirements prescribed in this classification. The final results to be used shall be the average of at least two sets of results, each of which has been obtained by following in detail the specified testing procedures.

## 7. Keywords

7.1 brick; refractories; silica

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