Designation: C604 – 18

Standard Test Method for True Specific Gravity of Refractory Materials by Gas-Comparison Pycnometer[1]

This standard is issued under the fixed designation C604; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the true specific gravity of solid materials, and is particularly useful for materials that easily hydrate which are not suitable for test with Test Method C135. This test method may be used as an alternate for Test Methods C135, C128, and C188 for determining true specific gravity.

1.2 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.2.1 *Exception*—In 7.3, the equivalent SI unit is expressed in parentheses.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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:*[2]

C128 Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate

C135 Test Method for True Specific Gravity of Refractory Materials by Water Immersion

C188 Test Method for Density of Hydraulic Cement

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Summary of Test Method

3.1 The sample is powdered to ensure permeation of gas into all pores. For practical purposes, this is assumed to be true when the sample passes a No. 325 (45-μm) U.S. sieve as specified in Specification E11. The volume of a carefully weighed powdered sample, which has first been heated to drive off moisture and undesired combined water, is measured by the gas-comparison pycnometer. Density is calculated from the sample weight in grams divided by its volume in cubic centimetres. This is also the specific gravity of the sample at room temperature compared to water at 4 °C.

3.2 The principle of the gas-comparison pycnometer is as follows: There are two chambers and two pistons as sketched in Fig. 1. For purposes of illustration, the chambers are assumed to be equal in volume, and there is no sample in either cylinder. Under these conditions, with the coupling valve closed, any change in the position of one piston must be duplicated by an identical stroke in the other in order to maintain the same pressure on each side of the differential pressure indicator.

3.3 If a sample, V_x, is inserted into chamber *B*, the coupling valve closed and both pistons advanced the same amount from position *1* to position *2*, the pressures will not remain the same. However, the pressures can be maintained equal if piston *B* instead is moved only to position *3*. Then the remaining displacement d_x, from position *3* to position *2*, is equal to the volume of the sample, V_x. If piston *A* always is advanced exactly the same distance each time a measurement is made, the distance that piston *B* differs from position *2*, when the pressures in both cylinders are equal, will always be proportional to the volume, V_x. The distance (d_x) between positions *2* and *3* can be calibrated and made to read directly in terms of cubic centimetres, employing a digital counter.

4. Significance and Use

4.1 The true specific gravity of a material is the ratio of its true density, determined at a specific temperature, to the true

[1] This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.03 on Physical Properties.

Current edition approved Oct. 1, 2018. Published October 2018. Originally approved in 1967. Last previous edition approved in 2012 as C604 – 02 (2012). DOI: 10.1520/C0604-18.

[2] 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.