



Standard Test Methods for Chemical Analysis of Glass Sand¹

This standard is issued under the fixed designation C146; 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 These test methods cover the chemical analysis of glass sands. They are useful for either high-silica sands (99 % + silica (SiO_2)) or for high-alumina sands containing as much as 12 to 13 % alumina (Al_2O_3). Generally nonclassical, the test methods are rapid and accurate. They include the determination of silica and of total R_2O_3 (see 11.2.4), and the separate determination of total iron as iron oxide (Fe_2O_3), titania (TiO_2), chromium oxide (Cr_2O_3), zirconia (ZrO_2), and ignition loss. Included are procedures for the alkaline earths and alkalis. High-alumina sands may contain as much as 5 to 6 % total alkalis and alkaline earths. It is recommended that the alkalis be determined by flame photometry and the alkaline earths by absorption spectrophotometry.

1.2 These test methods, if followed in detail, will provide interlaboratory agreement of results.

NOTE 1—For additional information, see Test Methods C169 and Practices E50.

1.3 The test methods appear in the following order:

Procedures for Referee Analysis:	Section
Silica (SiO_2)—Double Dehydration	10
Total R_2O_3 —Gravimetric	11
Fe_2O_3 , TiO_2 , ZrO_2 , Cr_2O_3 , by Photometric Methods and Al_2O_3 by Compleximetric Titration	12 – 17
Preparation of the Sample for Determination of Iron Oxide, Titania, Alumina, and Zirconia	12
Iron Oxide (as Fe_2O_3) by 1,10-Phenanthroline Method	13
Titania (TiO_2) by the Tiron Method	14
Alumina (Al_2O_3) by the CDTA Titration Method	15
Zirconia (ZrO_2) by the Pyrocatechol Violet Method	16
Chromium Oxide (Cr_2O_3) by the 1,5-Diphenylcarbohydrazide Method	17
Procedures for Routine Analysis:	
Silica (SiO_2)—Single Dehydration	19
Al_2O_3 , CaO , and MgO —Atomic Absorption Spectrophotometry	20–25
Na_2O and K_2O —Flame Emission Spectrophotometry	26–27
Loss on Ignition (LOI)	28

¹ These test methods are under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and are the direct responsibility of Subcommittee C14.02 on Chemical Properties and Analysis.

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1.4 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

C169 Test Methods for Chemical Analysis of Soda-Lime and Borosilicate Glass

C429 Test Method for Sieve Analysis of Raw Materials for Glass Manufacture

D1193 Specification for Reagent Water

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E50 Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials

E60 Practice for Analysis of Metals, Ores, and Related Materials by Spectrophotometry

2.2 Other Documents:

NIST Special Publication 260³

3. Significance and Use

3.1 These test methods can be used to ensure that the chemical composition of the glass sand meets the compositional specification required for this raw material.

3.2 These test methods do not preclude the use of other methods that yield results within permissible variations. In any case, the analyst should verify the procedure and technique used by means of a National Institute of Standards and Technology (NIST) standard reference material or other similar material of known composition having a component comparable with that of the material under test. A list of standard reference materials is given in the NIST *Special Publication 260*, current edition.

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.

³ Standard samples available from the National Institute of Standards and Technology are listed in U.S. Dept. of Commerce, NIST, *Special Publication 260* (current edition), Washington, DC 20234.