



Standard Test Methods for Chemical Analysis of Ceramic Whiteware Clays¹

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1. Scope

1.1 These test methods cover the chemical analysis of clays used in the manufacture of ceramic whitewares.

1.2 The analytical procedures appear in the following order:

	Section
Moisture	7
Loss on Ignition	8
Silica	9
Iron, Aluminum, and Titanium Oxides	10
Iron Oxide	11
Titania	12
Alumina	13
Lime	14
Magnesia	15
Alkalies	16

NOTE 1—These test methods have been compiled as standard procedures for use in referee analyses. These test methods, however, when the determination of iron oxide as Fe_2O_3 is involved, are not intended to preclude the use of other procedures that give results within the permissible variations. For the sake of uniformity the classical Zimmerman-Reinhardt procedure is specified for the determination of iron oxide. It is recognized that numerous other procedures are equally accurate and often more convenient. The other procedures commonly in use include reduction of an oxidized solution with zinc or other metal, and titration with standard potassium permanganate (KMnO_4) or potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) solution, as well as titration with a standard solution of titanous chloride in an oxidized solution. These procedures shall be considered acceptable, provided the analyst has obtained results by his special procedure that check with the Zimmerman-Reinhardt procedure within the limits specified in Section 17. It is suggested that National Institute of Standards and Technology standard samples be used for checking the accuracy of procedures.

It will be understood that the making of a complete analysis of a ceramic whiteware clay is a difficult procedure requiring a wide knowledge of the chemistry involved in the operations and a thorough training in carrying out the work. A skilled analyst of good training is therefore required to do the work. The descriptions here given cover the vital points of procedure, but frequent reference in regard to the details of the various manipulations should be made to “Applied Inorganic Analysis” by Hillebrand and Lundell² and to similar publications. Particularly in the determination of alumina, reference should be made to *Scientific Paper*

No. 286 of the National Bureau of Standards.³

1.3 The values stated in acceptable metric units are to be regarded as the standard. The values given in parentheses are for information only.

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*:⁴

C322 Practice for Sampling Ceramic Whiteware Clays

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Reagents

3.1 Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁵ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. Unless otherwise indicated, references to water shall be understood to mean distilled water. Paragraphs 3.1.1 – 3.1.16 include those reagents common to two or more of the analytical procedures. Other reagents will be found listed with the particular test method in which they are prescribed.

3.1.1 *Concentrated Acids and Ammonium Hydroxide*—Concentrated acids and ammonium hydroxide of approximately the following specific gravities or concentrations will be required:

³ Blum, W., “Determination of Alumina as Oxide,” National Bureau of Standards, *Scientific Paper No. 286*.

⁴ 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.

⁵ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

¹ These test methods are under the jurisdiction of ASTM Committee C21 on Ceramic Whitewares and Related Products and are the direct responsibility of Subcommittee C21.04 on Raw Materials.

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² Hillebrand, W. F., and Lundell, G. E. F., *Applied Inorganic Analysis*, Wiley and Son, New York, 1929.