



~~Designation: C1203-91 (Reapproved 1996)~~ Designation: C 1203 – 04 (Reapproved 2009)

Standard Test Method for Quantitative Determination of Alkali Resistance of a Ceramic-Glass Enamel¹

This standard is issued under the fixed designation C 1203; 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 resistance of a fired ceramic-glass enamel to a 10 % alkali solution held near its boiling point for 2 h.

1.2 This test method is not applicable to large tempered glass sheets or specimens larger than 9 by 9 cm.

1.3

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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.* For specific hazard statements, see Section 9.

2. Referenced Documents

2.1 *ASTM Standards:*²

C 162 Terminology of Glass and Glass Products

C 927 ~~Test Method for Lead and Cadmium Extracted from the Lip and Rim Area of Glass Tumblers Externally Decorated with Ceramic Glass Enamels~~² Test Method for Lead and Cadmium Extracted from the Lip and Rim Area of Glass Tumblers Externally Decorated with Ceramic Glass Enamels

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 *Definitions*—For additional definitions of terms refer to Terminology C 162.

3.1.1 *ceramic glass enamels (also glass enamels or ceramic enamels)*—predominantly colored, silicate-glass fluxes used to decorate glassware. **C 927**

3.1.2 *maturity—of a fired ceramic glass enamel*, a ceramic glass enamel has been fired to maturity when porosity of the ceramic glass enamel has been substantially eliminated, and the expected surface gloss of the fired ceramic glass enamel has been achieved.

3.1.2.1 *Discussion*—Refer to *GTA Engineering Standards Manual*, Section 4, D.3.3.1 and D.3.4.1, for testing criteria for maturity.³

4. Summary of Test Method

4.1 This test method measures the weight loss of a glass specimen decorated with a fired ceramic-glass enamel, when completely immersed in a 10 % alkali solution near its boiling point. A stainless steel beaker containing test samples and a 10 % alkali solution is heated at 95°C in a temperature controlled water bath for 2 h. Chemical dissolution of the ceramic-glass-enamel coating as well as any loss of weight due to the dissolution of the substrate is measured by determining weight loss of the specimen after exposure to the hot alkali solution. A substrate without ceramic-glass enamel is tested to determine the expected weight loss due to dissolution of the nondecorated side of the substrate.

5. Significance and Use

5.1 This test method is intended to be used when a quantitative measurement of the alkali durability of a ceramic-glass enamel is needed. The test is applicable to glass coated with fired enamels where exposure to strong alkalis, or alkalis at elevated

¹ This test method is under the jurisdiction of ASTM Committee ~~E-14~~C14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.10 on Glass Decoration.

Current edition approved Nov. 15, 1991. Published January 1992.

Current edition approved May 1, 2009. Published September 2009. Originally approved in 1991. Last previous edition approved in 2004 as C 1203 – 04.

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*, Vol 15.02, volume information, refer to the standard's Document Summary page on the ASTM website.

³ *GTA Engineering Standards Manual*, Glass Tempering Association, Topeka, KS, 1992.

temperatures might be encountered in service.

5.2 This test method is intended to be an accelerated, destructive test. Results can be used as an indicator of the relative durability of a particular enamel.

6. Interferences

6.1 The extent to which an enamel has been fired to maturity, as well as the residual stresses remaining after annealing of test specimen, can influence results.

6.2 Tests performed on tempered or heat-strengthened production ware should be done by annealing the chosen sheet before cutting the specimen.

7. Apparatus

- 7.1 *Balance or Scale*, accurate to 0.1 g, to weigh reagents.
- 7.2 *Balance*, accurate to 0.1 mg, to weigh specimens.
- 7.3 *Waterbath*, temperature controlled, capable of holding $95 \pm 3^\circ\text{C}$.
- 7.4 *Glass Marking Scribe*.
- 7.5 *Beaker*, stainless steel, 1200-mL, with no pouring lip, as shown in Fig. 1.
- 7.6 *Cover*, stainless steel, for beaker.
- 7.7 *Sample Holder*, as shown in Fig. 1.
- 7.8 *Tongs*, heavy duty.
- 7.9 *Rubber Gloves*, chemically resistant.
- 7.10 *Apron or Lab Coat*, chemically resistant.
- 7.11 *Face Shield*.
- 7.12 *Fume Hood*, for ventilation.
- 7.13 *Cloth*, soft cotton.
- 7.14 *Caliper*, micrometer, accurate to 0.1 mm.
- 7.15 *Oven*, drying, capable of heating samples at $65 \pm 5^\circ\text{C}$.

8. Reagents and Materials

- 8.1 *Alkali Solution*—Dissolve 70 g of sodium hydroxide (NaOH) in 630 mL of distilled water.

9. Hazards

- 9.1 Refer to the manufacturer's Material Safety Data Sheets for information regarding these materials.

