



## Standard Test Method for Acid Resistance of Ceramic Decorations on Architectural- Type Glass<sup>1</sup>

This standard is issued under the fixed designation C724; 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 test method covers qualitative determination of the acid resistance of the ceramic decoration on architectural glass.

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

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

### 2. Terminology

#### 2.1 Definitions:

2.1.1 *architectural glass*—glass used in the building industry.

### 3. Summary of Test Method

3.1 This test method qualitatively determines, by visual inspection, the degree of attack upon a ceramic decoration by a 10 % citric acid solution and a nominal 3.7 % hydrochloric acid solution.

### 4. Significance and Use

4.1 This test method evaluates the quality and serviceability of a ceramic decoration on architectural type glass. The degree of attack is determined using an acidic solution both quantitatively and qualitatively.

4.2 This test method provides a convenient control test during the manufacture of the ware.

4.3 This test method is suitable for specification acceptance.

### 5. Reagent

5.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. 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.<sup>2</sup> 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.

5.2 *Citric Acid Solution (1 + 9)*—Add 10 parts by mass of reagent grade citric acid to 90 parts by mass of distilled water. Prepare fresh for each determination.

5.3 *Hydrochloric Acid Solution (1 + 9)*—Add 10 parts by mass of reagent grade concentrated hydrochloric acid (HCl) (36 to 38 %) to 90 parts by mass of distilled water.

### 6. Procedure

6.1 Place four drops of each acid solution on a separate location on the surface of the ceramic decoration of the architectural glass to be tested. Cover each spot with a watchglass to retard evaporation and prevent contamination. Acid should remain on the surface of the test specimen for 15 min at  $20 \pm 2^\circ\text{C}$ .

6.2 After 15 min of exposure, wash the acid solutions (1 + 9) from the test specimen with tap water and allow it to air dry.

### 7. Report

7.1 Report the following information:

7.1.1 The degree of attack by visual observation by grading as follows:

Grade 1—No attack apparent

Grade 2—Appearance of iridescence or visible stain on the exposed surface when viewed at a  $45^\circ$  angle but not apparent at angles less than  $30^\circ$

Grade 3—A definite stain which does not blur reflected images and is visible at angles less than  $30^\circ$

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.10 on Glass Decoration.

Current edition approved May 1, 2015. Published May 2015. Originally approved in 1974. Last previous edition approved in 2010 as C724 – 91 (2010). DOI: 10.1520/C0724-91R15.

<sup>2</sup> *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.

Grade 4—Definite stain with a gross color change or strongly iridescent surface visible at angles less than 30° and which may blur reflected images

Grade 5—Surface dull or matte with chalking possible

Grade 6—Significant removal of enamel with pinholing evident

Grade 7—Complete removal of enamel in exposed area

## 8. Precision and Bias

8.1 *Precision*—In round-robin testing and evaluation, the between-laboratory precision for citric-acid resistance determi-

nation was found to be  $\pm 1$  grade (95 % student's *t*). The within-laboratory precision for citric-acid resistance determination is estimated at no greater than  $\pm 1$  grade.

8.2 *Bias*—No justifiable statement can be made about the bias of this test method, because the subjective nature of grading may vary considerably among operators.

## 9. Keywords

9.1 acid resistance; architectural decorations; ceramic enamels; chemical durability

*ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>*