



Designation: D 4142 – 89 (Reapproved 1996)<sup>ε1</sup>

AMERICAN SOCIETY FOR TESTING AND MATERIALS  
100 Barr Harbor Dr., West Conshohocken, PA 19428  
Reprinted from the Annual Book of ASTM Standards. Copyright ASTM

## Standard Guide for Testing Epoxy Resins<sup>1</sup>

This standard is issued under the fixed designation D 4142; 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.

<sup>ε1</sup> NOTE—Keywords were added editorially in October 1996.

### 1. Scope

1.1 This guide covers methods for testing epoxy resins as listed in Table 1. All of the methods were tested by interlaboratory participation in accordance with usual ASTM guidelines. Each method specifies a recommended amount of sample for starting a separate analysis, but several of the procedures can be conducted on the same starting material if so desired. For example, viscosity, color, and density could be run on the same specimen.

1.2 *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:

- D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)<sup>2</sup>
- D 1209 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)<sup>3</sup>
- D 1259 Test Methods for Nonvolatile Content of Resin Solutions<sup>4</sup>
- D 1475 Test Method for Density of Paint, Varnish, Lacquer, and Related Products<sup>4</sup>
- D 1544 Test Method for Color of Transparent Liquids (Gardner Color Scale)<sup>4</sup>
- D 1545 Test Method for Viscosity of Transparent Liquids by Bubble Time Method<sup>5</sup>
- D 1639 Test Method for Acid Value of Organic Coating Materials<sup>5</sup>
- D 1652 Test Method for Epoxy Content of Epoxy Resins<sup>5</sup>
- D 1726 Test Method for Hydrolyzable Chlorine Content of Liquid Epoxy Resins<sup>5</sup>

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.33 on Polymers and Resins.

Current edition approved April 28, 1989. Published June 1989. Originally published as D 4142 – 82. Last previous edition D 4142 – 82<sup>ε1</sup>.

<sup>2</sup> Annual Book of ASTM Standards, Vol 05.01.

<sup>3</sup> Annual Book of ASTM Standards, Vol 06.04.

<sup>4</sup> Annual Book of ASTM Standards, Vol 06.01.

<sup>5</sup> Annual Book of ASTM Standards, Vol 06.03.

TABLE 1 Methods for Testing Epoxy Resins

Test Method	Section	ASTM Designation
Epoxy content	4	D 1652
Hydrolyzable chlorine	5	D 1726
Total chlorine	6	D 1847
Viscosity	7	D 445, D1545
Color	8	D 1544, D1209
Density	9	D 1475
Nonvolatile content	10	D 1259
Acid value	11	D 1639

D 1847 Test Methods for Total Chlorine Content of Epoxy Resins<sup>5</sup>

### 3. Significance and Use

3.1 This guide directs the user to test methods that determine properties generally accepted as standard test items for classification of epoxy resins.

### 4. Epoxy Content

4.1 The epoxy content of epoxy resins is determined by reacting a solution of the resin with a standard solution of hydrogen bromide in glacial acetic acid. The quantity of acid consumed is a measure of the epoxy content. Test Methods D 1652 was found to have a repeatability of 2 % of the epoxy content and a reproducibility of 6 % of the epoxy content.

### 5. Hydrolyzable Chlorine

5.1 Test Method D 1726 covers the determination of the easily hydrolyzable chlorine content of liquid epoxy resins in concentrations below 1 weight %. The specimen is refluxed with a known amount of a standard alcoholic potassium hydroxide solution. The amount of hydroxide consumed is measured by titration and corresponds to the hydrolyzable chlorine content of the resin. By interlaboratory testing, the repeatability was found to be 0.02 %, and the reproducibility was found to be 0.05 %, both absolute.

### 6. Total Chlorine

6.1 Organic and inorganic chlorine compounds are determined in epoxy resins in accordance with Test Methods D 1847. The resin specimen is oxidized by combustion in a bomb containing oxygen under pressure. The chlorides formed are dissolved in a sodium carbonate solution and then either titrated or determined gravimetrically. The absolute repeatability and reproducibility for the titration method are 0.02 and