



Designation: D3546 – 05

## Standard Test Method for Formic Acid in Glacial Acetic Acid<sup>1</sup>

This standard is issued under the fixed designation D3546; 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 the determination of the formic acid (and other reducing substances) content of glacial acetic acid by oxidation with lead tetraacetate.<sup>2</sup>

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 For purposes of determining conformance of an observed or a calculated value using this test method to relevant specifications, test result(s) shall be rounded off “to the nearest unit” in the last right-hand digit used in expressing the specification limit, in accordance with the rounding-off method of Practice E29.

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.*

1.5 For hazard information and guidance, see the supplier’s Material Safety Data Sheets.

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>3</sup>

D1193 Specification for Reagent Water

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E200 Practice for Preparation, Standardization, and Storage of Standard and Reagent Solutions for Chemical Analysis

### 3. Summary of Test Method

3.1 In an aqueous acetic acid solution each molecule of formic acid is oxidized to one molecule of carbon dioxide by reduction of one molecule of lead tetraacetate. The amount of

lead tetraacetate remaining is then determined by adding potassium iodide and titrating the liberated iodine with standard sodium thiosulfate solution to the starch end point.

### 4. Significance and Use

4.1 This test method is useful for determining the formic acid content of glacial acetic acid by chemical means.

4.2 Low molecular weight organic acids (such as acetic and propionic), aldehydes (including formaldehyde and acetaldehyde), ketones, and alcohols (including methyl alcohol) do not interfere with the test.

4.3 Formic acid (and other reducing substances) may be present as a result of contamination during storage, distribution, and manufacture. This test method may be used in assessing compliance with a specification.

### 5. Reagents

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>4</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 *Purity of Water*—Unless otherwise indicated reference to water shall be understood to mean reagent water conforming to Type IV of Specification D1193.

5.3 *Lead Tetraacetate Solution*—Dissolve completely 40.0 g of sodium acetate in 1 L of glacial acetic acid and then dissolve 40.0 g of lead tetraacetate.

5.4 *Sodium Thiosulfate Standard Solution (0.1 N)*—Prepare and standardize 0.1 N sodium thiosulfate ( $\text{Na}_2\text{S}_2\text{O}_3$ ) as described in Practice E200.

5.5 *Starch Indicator Solution*—Prepare the starch indicator solution as described in Practice E200.

5.6 *Stopping Solution*—Dissolve 100 g of potassium iodide and 500 g of sodium acetate in 1 L of water.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.35 on Solvents, Plasticizers, and Chemical Intermediates.

Current edition approved May 15, 2005. Published June 2005. Originally approved in 1976. Last previous edition approved in 1999 as D3546 – 90 (1999). DOI: 10.1520/D3546-05.

<sup>2</sup> Perlin, A. S., “Determination of Formic Acid by Oxidation with Lead Tetraacetate,” *Analytical Chemistry*, Vol 26, 1954, pp. 1053–1054.

<sup>3</sup> 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.

<sup>4</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.

\*A Summary of Changes section appears at the end of this standard.