



Designation: D1992 – 17

## Standard Guide for Testing Synthetic Plasticizers Used in Rubber<sup>1</sup>

This standard is issued under the fixed designation D1992; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope

1.1 This guide covers test methods for synthetic plasticizers that are used in rubber applications.

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.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[D70 Test Method for Density of Semi-Solid Bituminous Materials \(Pycnometer Method\)](#)

[D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester](#)

[D891 Test Methods for Specific Gravity, Apparent, of Liquid Industrial Chemicals](#)

[D1045 Test Methods for Sampling and Testing Plasticizers Used in Plastics](#)

[D1209 Test Method for Color of Clear Liquids \(Platinum-Cobalt Scale\)](#)

[D1218 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids](#)

[D1544 Test Method for Color of Transparent Liquids \(Gardner Color Scale\)](#)

[D1962 Test Method for Saponification Value of Drying Oils, Fatty Acids, and Polymerized Fatty Acids \(Withdrawn 2004\)](#)<sup>3</sup>

[D2111 Test Methods for Specific Gravity and Density of Halogenated Organic Solvents and Their Admixtures](#)

[D2196 Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer](#)

[D2288 Test Method for Weight Loss of Plasticizers on Heating \(Withdrawn 2010\)](#)<sup>3</sup>

[E203 Test Method for Water Using Volumetric Karl Fischer Titration](#)

[E1953 Practice for Description of Thermal Analysis and Rheology Apparatus](#)

### 3. Significance and Use

3.1 Synthetic plasticizers are primarily esters and they are used with the more polar elastomers such as CR or NBR to improve processing, adjust hardness, and improve low temperature properties. These esters may be either monomeric or polymeric and are derived from many different organic acids.

3.2 These test methods may be used in establishing and confirming quality control standards for the synthetic plasticizers used in rubber compounding. It is not implied that the test methods in this guide are the only ones of significance, but these test methods list the properties most commonly specified for ester plasticizers. Other parameters may be needed for specific application of these materials.

### 4. Sampling

4.1 The method of sampling for either tank cars or drums is described in Test Methods [D1045](#).

### 5. Volatility

5.1 Volatility is normally measured as mass loss after 2 and 24 h when tested at 155°C. The procedure is described in Test Method [D2288](#).

### 6. Moisture

6.1 The moisture content should be determined using the Karl Fischer reagent procedure as described in Test Method [E203](#).

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D11 on Rubber and Rubber-like Materials and is the direct responsibility of Subcommittee D11.20 on Compounding Materials and Procedures.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

## 7. Acid Number

7.1 The acid number, expressed as milligrams of KOH per gram of plasticizer, may be determined from Test Methods **D1045**.

## 8. Saponification Number

8.1 The saponification value is expressed in milligrams per gram of plasticizer and may be determined by Test Method **D1962**.

## 9. Color

9.1 For clear light colored plasticizers, the APHA platinum-cobalt color standards may be used as described in Test Method **D1209**, but for darker or more oily plasticizers, the Gardner color standards are necessary. The Gardner procedure is described in Test Method **D1544**.

## 10. Specific Gravity

10.1 The apparent specific gravity of plasticizers should be reported at 25/25°C unless different conditions are mutually agreed upon. For low viscosity plasticizers the specific gravity may be determined using a Westphal balance as described in Test Methods **D2111** or the hydrometer procedure that is described in Test Methods **D891**. Plasticizers with medium viscosity should be tested by the pycnometer procedure as

described in Test Methods **D891** and highly viscous plasticizers should be tested by the procedure in Test Method **D70**.

## 11. Viscosity

11.1 The viscosity of plasticizers is normally measured at 25°C by a rotational viscometer (Practice **E1953**). The procedure for the test is given in Test Methods **D2196**.

## 12. Refractive Index

12.1 The test for refractive index is completely described in Test Method **D1218** but can also be run by the procedure described in Test Methods **D1045** except that the test temperature should be at 25°C.

## 13. Assay

13.1 A titrimetric analysis method may be used which is given in Test Methods **D1045** but a more desirable method by either gas chromatography analysis or infrared analysis will be developed.

## 14. Flammability

14.1 The flash point of synthetic plasticizers should be run by the Cleveland Open Cup, Test Method **D92**.

## 15. Keywords

15.1 ester plasticizer classification; plasticizer classification; synthetic plasticizer classification

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