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Standard Guide for Testing Synthetic Plasticizers Used in Rubber¹

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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.*

2. Referenced Documents

2.1 ASTM Standards:

- D 70 Test Method for Specific Gravity and Density of Semi-Solid Bituminous Materials²
- D 92 Test Method for Flash and Fire Points by Cleveland Open Cup³
- D 891 Test Methods for Specific Gravity, Apparent, of Liquid Industrial Chemicals⁴
- D 1045 Test Methods for Sampling and Testing Plasticizers Used in Plastics⁵
- D 1209 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)⁶
- D 1218 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids³
- D 1544 Test Method for Color of Transparent Liquids (Gardner Color Scale)⁷
- D 1962 Test Method for Saponification Value of Drying Oils, Fatty Acids, and Polymerized Fatty Acids⁸
- D 2111 Test Methods for Specific Gravity of Halogenated Organic Solvents and Their Admixtures⁴
- D 2196 Test Method for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer⁷
- D 2288 Test Method for Weight Loss of Plasticizers on Heating⁵

E 203 Test Method for Water Using Volumetric Karl Fischer Reagent⁴

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 Method D 1045.

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 D 2288.

6. Moisture

6.1 The moisture content should be determined using the Karl Fischer reagent procedure as described in Test Method E 203.

7. Acid Number

7.1 The acid number, expressed as milligrams of KOH per gram of plasticizer, may be determined from Methods D 1045.

8. Saponification Number

8.1 The saponification value is expressed in milligrams per gram of plasticizer and may be determined by Test Method D 1962.

9. Color

9.1 For clear light colored plasticizers the APHA platinum-cobalt color standards may be used as described in Test Method D 1209 but for darker or more oily plasticizers the Gardner

¹ This guide is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.20 on Compounding Materials and Procedures.

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² *Annual Book of ASTM Standards*, Vol 04.03.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ *Annual Book of ASTM Standards*, Vol 15.05.

⁵ *Annual Book of ASTM Standards*, Vol 08.01.

⁶ *Annual Book of ASTM Standards*, Vol 06.04.

⁷ *Annual Book of ASTM Standards*, Vol 06.01.

⁸ *Annual Book of ASTM Standards*, Vol 06.03.

color standards are necessary. The Gardner procedure is described in Test Method D 1544.

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 D 2111 or the hydrometer procedure that is described in Test Methods D 891. Plasticizers with medium viscosity should be tested by the pycnometer procedure as described in Test Method D 891 and highly viscous plasticizers should be tested by the procedure in Test Method D 70.

11. Viscosity

11.1 The viscosity of plasticizers is normally measured at 25°C by a Brookfield viscometer. The procedure for the test is given in Test Method D 2196.

12. Refractive Index

12.1 The test for refractive index is completely described in

Test Method D 1218 but can also be run by the procedure described in Methods D 1045 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 Methods D 1045 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 D 92.

15. Keywords

15.1 ester plasticizer classification; plasticizer classification; synthetic plasticizer classification

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