



Standard Test Methods for Fatty and Rosin Acids in Tall Oil Fractionation Products by Capillary Gas Chromatography¹

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1. Scope

1.1 These test methods cover the determination of the amounts of the individual fatty acids and rosin acids in fractionated tall oil products, using capillary gas chromatographic separation of the volatile methyl esters of these acids.

1.2 Four methods for forming the methyl esters, and two methods for determining the amounts of the individual fatty acids and rosin acids are described.

1.2.1 The classic method for the formation of methyl esters is through the use of diazomethane, but diazomethane is a hazardous and toxic material, and so is no longer the preferred reagent. The use of diazomethane is detailed in the Appendix. Methyl esters may be formed through the use of tetramethylammonium hydroxide (TMAH), trimethylphenylammonium hydroxide (TMPAH), or N,N-dimethylformamide dimethyl acetal (DMF-DMA).

1.2.2 The two methods for determining the amount of the individual fatty acids and rosin acids are the “internal standard” method, which yields absolute values, and the “area percent” method, which yields relative values.

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. Referenced Documents

2.1 ASTM Standards:²

D509 Test Methods of Sampling and Grading Rosin
D804 Terminology Relating to Pine Chemicals, Including Tall Oil and Related Products

¹ These test methods are under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee D01.34 on Pine Chemicals and Hydrocarbon Resins.

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² 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.

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Significance and Use

3.1 Tall oil fractionated products derived from tall oil are important commercial materials, primarily composed of fatty acids and rosin acids, but also containing some neutral material (see Terminology D804). For many applications, it is necessary to know the level of the individual fatty acids and rosin acids present in these products. Gas chromatography has proven to be a useful tool for such determinations (see Test Methods D509), and capillary chromatography, described in these test methods, is considered to be the most effective gas chromatographic technique currently available. In particular situations, other techniques may be more suitable than gas chromatography. For example, the presence of fatty acid esters in the sample would result in transesterification during the derivatization step that may affect the results.

3.2 Due to hydrogen bonding, unmodified tall oil fatty acids and rosin acids cannot be volatilized at atmospheric pressure without undergoing decomposition. So, it is necessary to convert the free acids to the more volatile and more stable methyl esters, prior to chromatographic separation.

3.3 These test methods describe four ways to prepare methyl esters. The classic method is through the use of diazomethane, but diazomethane is a hazardous and toxic material, and so is no longer the preferred agent. The use of diazomethane is detailed in Appendix X1.

3.3.1 TMAH causes isomerization of a sample's di- and polyunsaturated fatty acids, when it is used in even a slight excess. This leads to inaccurate results for the individual fatty acid components. TMAH should be used for materials containing only rosin acids, or when the identification or quantitation of individual fatty acid components is not important.

3.3.2 TMPAH is the recommended methylating agent when the identification or quantitation of individual di- and polyunsaturated fatty acids is required. TMPAH produces results that are very similar to those of diazomethane, but without the hazards that are associated with diazomethane. A considerable excess of TMPAH may cause isomerization of conjugated compounds similar to that encountered with TMAH.