



Standard Test Method for Determination of Total Aromatics and Total Saturates in Lube Basestocks by High Performance Liquid Chromatography (HPLC) with Refractive Index Detection¹

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1. Scope*

1.1 This test method covers the determination of total aromatics and total saturates in additive-free lube basestocks using high performance liquid chromatography (HPLC) with refractive index (RI) detection. This test method is applicable to samples containing total aromatics in the concentration range of 0.2 to 46 mass %.

1.1.1 Polar compounds, if present, are combined with the total aromatics. Precision was determined for basestocks with polars content < 1.0 mass %.

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 *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

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

3. Terminology

3.1 Definitions:

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.04.0C on Liquid Chromatography.

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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.

3.1.1 *aromatics, n—in high performance liquid chromatography*, aromatic hydrocarbon components, minus polar material, that has a longer retention time than saturates on the specified polar columns, but can be removed as a single peak by backflushing the columns with heptane.

3.1.1.1 *Discussion*—Generally, aromatic hydrocarbons contain 1 to 4 rings.

3.1.2 *backflush, v*—elution of the HPLC mobile phase in the backward or reverse direction from the silica gel column towards the cyano column.

3.1.2.1 *Discussion*—In this test method, it is used to elute the total aromatics plus polars as one sharp component.

3.1.3 *foreflush, v*—elution of HPLC mobile phase in the forward direction.

3.1.3.1 *Discussion*—In this test method, the sample enters the cyano column first followed by elution through the silica gel column.

3.1.4 *polars, n—in high performance liquid chromatography*, components that may contain organically bonded nitrogen, oxygen and oxidized sulfur components and are more strongly retained than aromatic hydrocarbons.

3.1.4.1 *Discussion*—In this HPLC method, polars are backflushed with the aromatics and the two cannot be distinguished. Generally present in very small amounts, such as < 1 mass %.

3.1.5 *saturates, n*—hydrocarbon components that are not retained strongly by the specified polar columns when heptane is used as the mobile phase.

3.1.5.1 *Discussion*—Generally, these consist of paraffins and cycloparaffins.

4. Summary of Test Method

4.1 A known mass of sample is diluted in the mobile phase and a fixed volume of this solution is injected into a calibrated high performance liquid chromatograph. The separation column set has little affinity for the saturates while retarding the aromatic hydrocarbons and the polars. As a result of this retardation, the aromatic hydrocarbons and polars are separated from the saturates. At a predetermined time, after the elution of the saturates, the column is backflushed to elute the aromatics and polars as a single sharp band.

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