



Standard Test Method for Estimation of Mean Relative Molecular Mass of Petroleum Oils from Viscosity Measurements¹

This standard is issued under the fixed designation D2502; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This test method covers the estimation of the mean relative molecular mass of petroleum oils from kinematic viscosity measurements at 100 °F and 210 °F (37.78 °C and 98.89 °C).² It is applicable to samples with mean relative molecular masses in the range from 250 to 700 and is intended for use with average petroleum fractions. It should not be applied indiscriminately to oils that represent extremes of composition or possess an exceptionally narrow mean relative molecular mass range.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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:³

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D7042 Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.04.0K on Correlative Methods.

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² Hirschler, A. E., *Journal of the Institute of Petroleum*, JIPEA, Vol 32, 1946, p. 133.

³ 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.

2.2 ASTM Adjuncts:

Mean Relative Molecular Mass of Petroleum Oils from Viscosity Measurements⁴

3. Summary of Test Method

3.1 The kinematic viscosity of the oil is determined at 100 °F and 210 °F (37.78 °C and 98.89 °C). A function “*H*” of the 100 °F viscosity is established by reference to a tabulation of *H* function versus 100 °F viscosity. The *H* value and the 210 °F viscosity are then used to estimate the mean relative molecular mass from a correlation chart.

4. Significance and Use

4.1 This test method provides a means of calculating the mean relative molecular mass of petroleum oils from another physical measurement.

4.2 Mean relative molecular mass is a fundamental physical constant that can be used in conjunction with other physical properties to characterize hydrocarbon mixtures.

5. Procedure

5.1 Determine the kinematic viscosity of the oil at 100 °F and 210 °F (37.78 °C and 98.89 °C) as described in Test Method **D445** or Test Method **D7042**.

5.2 Look in **Table 1** for 100 °F (37.78 °C) viscosity and read the value of *H* that corresponds to the measured viscosity. Linear interpolation between adjacent columns may be required.

5.3 Read the viscosity–mean relative molecular mass chart for *H* and 210 °F (98.89 °C) viscosity. A simplified version of this chart is shown in **Fig. 1** for illustration purposes only (**Note 1**). Interpolate where necessary between adjacent lines of 210 °F viscosity. After locating the point corresponding to the value of *H* (ordinate) and the 210 °F viscosity (superimposed lines), read the mean relative molecular mass along the abscissa.

⁴ Available from ASTM International Headquarters. Order Adjunct No. **ADJD2502**.

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