



Standard Test Method for Measuring Visible Spectrum of Asphaltenes in Heavy Fuel Oils and Crude Oils by Spectroscopy in a Microfluidic Platform¹

This standard is issued under the fixed designation D7996; 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 measurement, either in the laboratory or in the field, of visible spectra of asphaltenes and maltenes in gas oil, diesel fuel, fuel oils, residual fuel oils, lubricating oil, bitumen, and crude oil using microfluidics and spectrographic techniques.²

1.2 These measurements can be related quantitatively to the mass percent of asphaltenes present in the sample.

1.3 The test method is limited to asphaltene-containing oil with asphaltenes content less than 15 % by mass.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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

D3279 Test Method for n-Heptane Insolubles

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D6560 Test Method for Determination of Asphaltenes (Heptane Insolubles) in Crude Petroleum and Petroleum Products

E275 Practice for Describing and Measuring Performance of Ultraviolet and Visible Spectrophotometers

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, see Terminology **D4175**.

3.1.2 *absorbance, (A), n*—the molecular property of a substance that determines its ability to take up radiant energy, expressed by:

$$A = \log_{10}(1/T) = -\log_{10}(T) \quad (1)$$

where *T* is the transmittance.

3.1.2.1 *Discussion*—Absorbance expresses the excess absorption over that of a specified reference or standard. It is implied that compensation has been affected for reflectance losses, solvent absorption losses, and refractive effects, if present, and that attenuation by scattering is small compared with attenuation by absorption.

3.1.3 *asphaltenes* (rarely used in the singular), *n*—in petroleum technology, represent an oil fraction that is soluble in a specified aromatic solvent but separates upon addition of an excess of a specified paraffinic solvent.

3.1.3.1 *Discussion*—In this test method, the aromatic solvent is toluene and the paraffinic solvent is heptane.

3.1.4 *crude oil, n*—a naturally occurring hydrocarbon mixture, generally in a liquid state, which may also include compounds of sulfur, nitrogen, oxygen, metals, and other elements. (Synonym—crude petroleum, crude.)

3.1.5 *dilution factor (f), n*—the proportion of solvent increase made to reduce the concentration and thus the absorbance of a solute, expressed by the ratio of the volume of the diluted solution to the volume of original solution containing the same quantity of solute as the diluted solution.

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 D02.14 on Stability and Cleanliness of Liquid Fuels.

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² This method and the apparatus are covered by US Patent 8,269,961 and Canadian Patent 2,800,879. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

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.