Designation: D1807 – 00(Reapproved 2005)ε1

Standard Test Methods for Refractive Index and Specific Optical Dispersion of Electrical Insulating Liquids [1]

This standard is issued under the fixed designation D1807; 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.

ε[1] NOTE—The word "containment" was corrected to "contaminant" in the second sentence of 4.1 editorially in December 2009.

1. Scope

1.1 These test methods cover the determination of the refractive index and the specific optical dispersion of electrical insulating liquids such as are used in capacitors, transformers, circuit breakers, and oil-filled cables.

1.2 Two test methods are described, a routine method and a more precise referee method. Both methods are applicable to transparent, light-colored, insulating liquids.

1.2.1 The routine method is used to determine refractive index and specific optical dispersion as described in these test methods.

1.2.2 The referee method is used when a test of high accuracy is desired. These methods are described in Test Method D1218. Specific optical dispersion is calculated by dividing the refractive dispersion value determined in Test Method D1218 by the relative density (specific gravity) (see Test Method D1298) of the liquid under test.

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

1.4 *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]

D1218 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids

D1298 Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

3. Terminology

3.1 *Definitions:*

3.1.1 *refractive index, n*—the ratio of the velocity of light in air to its velocity in the substance under test.

3.1.2 *relative density (specific gravity), n*—the ratio of the mass of a given volume of liquid at 15°C (60°F) to mass of an equal volume of pure water at the same temperature.

3.1.3 *specific optical dispersion, n*—the difference between the refractive indexes of light of two different wavelengths, both indexes measured at the same temperature, and divided by the relative density (specific gravity), also measured at the test temperature.

4. Significance and Use

4.1 *Refractive Index*—The refractive index of an insulating liquid varies with its composition and with the nature and amount of contaminants held in solution. Changes of refractive index with time and service may form a basis for estimating any change in composition or the degree of contaminant acquired in service. For electrical insulating mineral oils, the wavelength of 5893 ˚A for the spectral line of sodium is commonly used. The test temperature is 25°C.

4.2 *Specific Optical Dispersion* —Specific optical dispersion serves as a quick index to the amount of unsaturated compounds present in an oil. Dispersion values for paraffinic and naphthenic compounds are nearly the same and are essentially independent of molecular weight and structural differences. Values above 97 bear a direct relationship to the amount of aromatic compounds present in insulating oil. For convenience, the specific dispersion value is multiplied by 10^4. For electrical insulating mineral oils, the wavelengths of 6563 and 4861 ˚A corresponding to the spectral lines of hydrogen are commonly used. Alternatively, the wavelengths of 6678 and 5016 ˚A corresponding to the spectral lines of helium may be used.

[1] These test methods are under the jurisdiction of ASTM Committee D27 on Electrical Insulating Liquids and Gasesand are the direct responsibility of Subcommittee D27.07 on Physical Test.

Current edition approved Oct. 1, 2005. Published November 2005. Originally approved in 1960. Last previous edition approved in 2000 as D1807 – 00. DOI: 10.1520/D1807-00R05E01.

[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.