Designation: D 5837 – 99$^{\epsilon 1}$

Standard Test Method for Furanic Compounds in Electrical Insulating Liquids by High-Performance Liquid Chromatography (HPLC)[1]

This standard is issued under the fixed designation D 5837; 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—Equation 3 in 16.3 was corrected editorially in November 2003.

1. Scope

1.1 This test method describes the determination in electrical insulating liquids of products of the degradation of cellulosic materials such as paper, pressboard, and cotton materials typically found as insulating materials in electrical equipment. These degradation products are substituted furan derivatives, commonly referred to as furanic compounds or furans. This test method allows either liquid/liquid or solid phase extraction (SPE) of the furanic compounds from the sample matrix followed by analysis for specific furanic compounds by HPLC or direct injection for analysis of specific furanic compounds by HPLC.

1.2 The individual furanic compounds that may be identified and quantified include the following:

5-hydroxymethyl-2-furaldehyde
furfuryl alcohol
2-furaldehyde
2-acetylfuran
5-methyl-2-furaldehyde

1.3 The direct injection method generally has a higher limit of detection, especially for furfuryl alcohol. Greater interference for furfuryl alcohol may be expected when using the direct injection method as opposed to extraction methods.

1.4 This test method has been used to successfully test for furanic compounds in mineral insulating oil, silicone fluid, high fire point electrical insulating oils of mineral origin, askarels, and perchloroethylene based dielectric fluids.

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:*

D 923 Test Method for Sampling Electrical Insulating Liquids[2]

D 3487 Specification for Mineral Insulating Oil Used in Electrical Apparatus[2]

D 3612 Test Method for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography[2]

D 3613 Test Methods for Sampling Electrical Insulating Oils for Gas Analysis and Determination of Water Content[2]

2.2 *International Electrotechnical Commission (IEC) Standard:*

Method 1198 Furanic Compounds Analysis in Mineral Oil Insulating Oil[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *adsorbent*, *n*—the stationary phase in solid-phase extraction; silica is used as the adsorbent in this test method.

3.1.2 *extract*, *n*—the liquid phase of a liquid/liquid extraction containing the compound that has been extracted and that will be analyzed.

3.1.3 *liquid/liquid extraction*, *n*—the preparative step of extraction by mixing nonpolar test specimen with polar solvent to preferentially partition and concentrate polar compounds of interest from an insulating liquid test specimen.

3.1.4 *mobile phase*, *n*—the carrier liquid phase in an HPLC analytical system used to transfer the prepared test specimen to and through the analytical column and detector; the composition of the mobile phase affects elution time and separation of analytes.

3.1.5 *solid phase extraction (SPE)*, *n*—a preparative step based on column chromatography, where intermolecular interactions between adsorbent, solvent, and test specimen components are optimized to effect retention of analytes on a solid-phase extraction cartridge, followed by solvent elution from the extraction cartridge.

[1] This test method is under the jurisdiction of ASTM Committee D27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D27.03 on Analytical Tests.

Current edition approved Oct. 10, 1999. Published December 1999. Originally published as D 5837 – 95. Last previous edition D 5837 – 95.

[2] *Annual Book of ASTM Standards*, Vol 10.03.

[3] Available from IEC, IEC Central Office, 3 rue de Varembe, P.O. Box 131, CH-1211, Geneva 20, Switzerland.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.