



Designation: D5837 – 15 (Reapproved 2023)

## Standard Test Method for Furanic Compounds in Electrical Insulating Liquids by High-Performance Liquid Chromatography (HPLC)<sup>1</sup>

This standard is issued under the fixed designation D5837; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers 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 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D923 Practices for Sampling Electrical Insulating Liquids  
D3487 Specification for Mineral Insulating Oil Used in Electrical Apparatus

D3612 Test Method for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography

2.2 *IEC Standard:*<sup>3</sup>

Method 1198 Furanic Compounds Analysis in Mineral Oil Insulating Oil

### 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.

<sup>1</sup> 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.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from International Electrotechnical Commission (IEC), 3, rue de Varembe, 1st floor, P.O. Box 131, CH-1211, Geneva 20, Switzerland, <https://www.iec.ch>.