

ASTM E1618-19 *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry* is the current standard for the analysis and reporting of fire debris analysis. Previous members of the Fire Debris and Explosives Analysis Subcommittee performed an evaluation of E1618 to determine its suitability, in its current format, as a potential OSAC Registry document.

While the document has served its purpose in transitioning the field from the use of FID to GCMS, it no longer meets the needs of the industry. E1618 represents the past 30 years of forensic practice but does not address the concerns that will dominate the future of forensic science. In addition to the increased understanding of ignitable liquid and matrix compositions, the expectations of the criminal justice community, and specifically of the OSAC process, require a significantly higher level of detail in standardized methods.

This OSAC subcommittee identified four areas in which to concentrate efforts for improvement:

1. Instrumental Analysis of ignitable liquids (IL) and ignitable liquid residues (ILR) by gas chromatography-mass spectrometry (GC-MS). Specific areas to be addressed include:
 - a. Development of QA/QC measures for GC-MS instrumentation in the context of ignitable liquid analysis
 - b. Refinement of criteria for instrument performance
 - c. Development of appropriate QC test mixtures/test compounds based upon both analytes of interest and sample preparation/extraction techniques
2. Ignitable Liquid Classification. Specific areas to be addressed include:
 - a. Consideration as a standalone document to be used during interpretation
 - b. Provision for better definition of and distinction between ignitable liquid classes
 - c. Improvement in the classification of IL mixtures
 - d. Refinement and revision of examples of products of each IL class
3. Interpretation of GC-MS data for IL/ILR. Specific areas to be addressed include:
 - a. Refinement of Extracted Ion Profiling (EIP) and requirements for single compound identification
 - b. Enhanced identification criteria for all classes
 - c. Inclusion of measures to address the interpretation of potential IL mixtures
4. Report Writing. Specific areas to be addressed include:
 - a. Enhancing verbiage to be clear and unbiased
 - b. Defining and normalizing report terminology

Since the original publication of the position statement, the OSAC Ignitable Liquids, Explosives, and Gunshot Residue (ILEGSR) subcommittee has made significant progress on editing 1618 and drafting new documents. The documents listed below are currently being balloted at ASTM and contain the following information:

- 1) WK81724: Standard Classification for Ignitable Liquids Encountered in Fire Debris Analysis. This new standard provides:
 - a. Improved classification of ignitable liquids with provisions for better definition of and distinction between ignitable liquid classes
 - b. Refinement and revision of examples of products of each IL class
 - c. Development of diagnostic features that include compounds and groupings of compounds used in the identification of a class of ignitable liquid
 - d. Example chromatograms of each class which helps users understand the diagnostic features for each classification
- 2) WK81720: Revision of E1618-19 Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry
 - a. Development of minimum QA/QC criteria for GC-MS instrumentation and performance in the context of ignitable liquid analysis
 - b. Development of appropriate QC test mixtures/test compounds based upon both analytes of interest and sample preparation/extraction techniques
 - c. Requirements for data evaluation and data presentation
 - d. Refinement of data interpretation considerations
 - e. Enhanced identification criteria for petroleum-based products, non-petroleum based products, and non-classifiable products such as single compounds and mixtures
 - f. Example GC-MS method configurations
 - g. Example chromatograms of various products which help users visualize the complications which are encountered when interpreting debris samples
- 3) WK73482: Standard Practice for Reporting Results and Opinions of Ignitable Liquids Analysis. This new standard provides:
 - a. Enhanced verbiage to be clear and unbiased
 - b. Normalizes report terminology
- 4) WK72631: Revision of E2549-14 (with title change) Standard Practice for Validation and Verification of Analytical methods for Forensic Science Service Providers Performing Forensic Chemical Analyses.
 - a. Broadened to serve as a framework for laboratories in validating chemical analysis methods
 - b. After the document is approved at ASTM, a fire debris-specific annex will be added to augment the overarching standard and provide tailored validation and verification requirements for fire debris

These documents are intended to be used together to fill in the gaps identified in the original assessment. Through their combined use, WK72631 will update instrumental methods to align with current industry standards, WK81724 will provide the basic features observed in each class, WK81720 provides the requirements needed to identify each class (to include both GC-MS method and data interpretation/evaluation requirements), and WK73482 provides appropriate wording for statements and sets the reporting requirements.

If you have implemented improvements in any of these areas, please contact us with specific details at Brenda.christy@dfs.virginia.gov.