NOTICE: This standard has either been superseded and replaced by a new version or withdrawn. Contact ASTM International (www.astm.org) for the latest information.

Designation: E1618 – 06$^{\varepsilon 1}$

Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry[1]

This standard is issued under the fixed designation E1618; 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—Editorial changes were made in November 2006.

1. Scope

1.1 This test method covers the identification of residues of ignitable liquids in extracts from fire debris samples. Extraction procedures are described in the referenced documents.

1.2 Although this test method is suitable for all samples, it is especially appropriate for extracts that contain high background levels of substrate materials or pyrolysis products. This test method is also suitable for the identification of single compounds, simple mixtures, or non-petroleum based ignitable liquids.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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]

E1385 Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Steam Distillation[3]

E1386 Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction

E1387 Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography

E1388 Practice for Sampling of Headspace Vapors from Fire Debris Samples

E1412 Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration With Activated Charcoal

E1413 Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Dynamic Headspace Concentration

E2154 Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration with Solid Phase Microextraction (SPME)

iTeh Standards (https://standards.iteh.ai) Document Preview ASTM E1618-06e1 https://standards.iteh.ai/catalog/standards/sist/fa41678e-d51

3. Summary of Test Method

3.1 The sample is analyzed with a gas chromatograph (GC) which is interfaced to a mass spectrometer (MS) and a data system (DS) capable of storing and manipulating chromatographic and mass spectral data.

3.2 Post-run data analysis generates extracted ion profiles (mass chromatograms) characteristic of the chemical compound types commonly found in ignitable liquids. Additionally, specific chemical components (target compounds) may be identified by their mass spectra and retention times. Semi-quantitative determination of target compounds which are identified by mass spectra and retention time may be used to develop target compound chromatograms (TCCs).

3.2.1 The total ion chromatogram (TIC), extracted ion profiles (EIP) for the alkane, alkene, alcohol, aromatic, cycloalkane, ester, ketone and polynuclear aromatic compound types, or target compound chromatograms (TCC), or combination thereof, are evaluated by visual pattern matching against known reference ignitable liquids.

---

[1] This test method is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.01 on Criminalistics.

Current edition approved June 1, 2006. Published June 2006. Originally approved in 1994. Last previous edition approved in 2001 as E1618 – 01. DOI: 10.1520/E1618-06E01.

[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.

[3] Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

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

3.2.2 Ignitable liquids may be grouped into one of seven major classifications or one miscellaneous class, as described in this test method.

4. Significance and Use

4.1 The identification of an ignitable liquid residue in samples from a fire scene can support the field investigator's opinion regarding the origin, fuel load, and incendiary nature of the fire.

4.1.1 The identification of an ignitable liquid residue in a fire scene does not necessarily lead to the conclusion that a fire was incendiary in nature. Further investigation may reveal a legitimate reason for the presence of ignitable liquid residues.

4.1.2 Due to the volatility of ignitable liquids and to variations in sampling techniques, the absence of detectable quantities of ignitable liquid residues does not necessarily lead to the conclusion that ignitable liquids were not present at the fire scene.

4.2 Materials normally found in a building, upon exposure to the heat of a fire, will form pyrolysis and combustion products. Extracted ion profiling and target compound identification techniques described herein may facilitate the identification of an ignitable liquid in the extract by reducing interference by components generated as products of pyrolysis.

5. Apparatus

5.1 *Gas Chromatograph*—A chromatograph capable of using capillary columns and being interfaced to a mass spectrometer.

5.1.1 *Sample Inlet System*—A sample inlet system that can be operated in either split or splitless mode with capillary columns; the inlet system may use on-column technology.

5.1.2 *Column*—A capillary, bonded phase, methylsilicone or phenylmethylsilicone column or equivalent. Any column length or temperature program conditions may be used provided that each component of the test mixture (see 6.4) is adequately separated.

5.1.3 *GC Oven*—A column oven capable of reproducible temperature program operation in the range from 50 to 300°C.

5.2 *Mass Spectrometer*—Capable of acquiring mass spectra from *m/z* 40 to *m/z* 400 with unit resolution or better, with continuous data output. Values above *m/z* 40 may not be sufficient to detect or identify some lower molecular weight compounds; for example, methanol, ethanol, acetone.

5.2.1 *Sensitivity*—The system must be capable of detecting each component of the test mixture (see 6.4) and providing sufficient ion intensity data to identify each component, either by computer library search or by comparison with reference spectra.

5.3 *Data Station*—A computerized data station, capable of storing time sequenced mass spectral data from sample runs.

5.3.1 *Data Handling*—The data system must be capable of performing, either through its operating system or by user programming, various data handling functions, including input and storage of sample data files, generation of extracted ion profiles, searching data files for selected compounds, and qualitative and semi-quantitative compound analysis.

5.3.2 *Mass Spectral Libraries*—The system must be capable of retrieving a specified mass spectrum from a data file and comparing it against a library of mass spectra available to the data system. This capability is considered an aid to the analyst, who will use it in conjunction with chromatographic data and known reference materials to identify unknown components.

5.4 *Syringes*:

5.4.1 *For liquid samples*, a syringe capable of introducing a sample size in the range from 0.1 to 10.0 µL.

5.4.2 *For gas samples*, a gas-tight syringe capable of introducing a sample size in the range of 0.5 to 5 mL.

6. Chemicals, Reagents, and Reference Materials

6.1 *Purity of Reagents*—Reagent grade or better chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Solvent/Diluent*—Carbon disulfide, diethyl ether, pentane, or other solvent that will not interfere with the analysis. It is generally desirable to use a solvent whose volatility greatly exceeds that of the solute to facilitate sample concentration by evaporation, if necessary.

6.2.1 Use of a heavier solvent, such as toluene or tetrachloroethylene, is sometimes necessary when the compounds of interest have low molecular weights.

6.3 *Carrier Gas*—Helium or hydrogen of purity 99.995 % or higher.

6.4 *Test Mixture*—The test mixture shall consist of a minimum of the even-numbered normal alkanes (ranging from *n*-octane through *n*-eicosane), methylbenzene (toluene), 1,4-dimethylbenzene (*p*-xylene), 1-methly-2-ethylbenzene (*o*-ethyltoluene), 1-methyl-3-ethylbenzene (*m*-ethyltoluene), and 1,2,4-trimethlybenzene (pseudocumene). Additional compounds may be included at the discretion of the analyst. The final test solution is prepared by diluting the above mixture such that the concentration of each component is 0.005 % volume/volume (0.05 microliters/milliliter) in the chosen solvent (see 6.2). A typical chromatogram of the test mixture is shown in Fig. 1.

6.5 *Reference Ignitable Liquids*—Ignitable liquids must be available for the various ignitable liquids represented in Table 1.

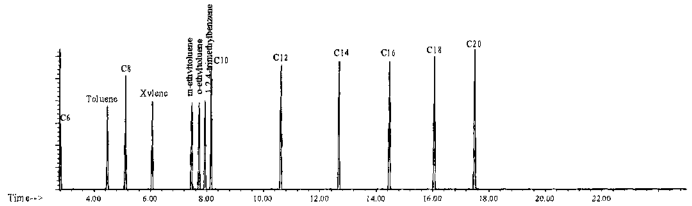
6.5.1 Typically, reference ignitable liquids are dilute 1:100 in an appropriate solvent. Depending on the column capacity and injection technique, ignitable liquid solutions can be made somewhat more concentrated to ensure detection of minor compounds.

6.5.2 Certified ignitable liquid standards are not necessary. Most reference ignitable liquids can be obtained from commercial and retail sources.

7. Equipment Calibration and Maintenance

7.1 Verify the consistent performance of the chromatographic instrument by using blanks and known concentrations of either prepared test mixture or other known ignitable liquids. Optimize gas flows periodically.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ASTM E1618-06e1
https://standards.iteh.ai/catalog/standards/sist/fa41628e-d516-44a8-8b8d-c98c26b1c0b7/astm-e1618-06e1



Chromatographic Conditions

Instrument: HP 5890 Gas Chromatograph
Detector: HP 5970 Mass Selective Detector
Column: 30 meter, Rtx-1 (polymethylsiloxane)
0.25mm ID, 0.25 micron film thickness
Sample: 1.0 microliter of 1% solution in pentane

Initial Temperature: 50C, 2.5 minutes
Rate: 15C/min
Final Temperature: 300C, 5.83 minutes
Total Run Time: 25.00 minutes
Split 20:1

NOTE: This is a typical chromatogram, provided for illustration only. Each laboratory is likely to obtain slightly different retention times and relative abundance of individual components, depending on sample history, separation procedure, and chromatographic conditions.

FIG. 1 Test Mixture Containing C8-C20 Normal Hydrocarbons, toluene, p-xylene, o-ethyltoluene, m-ethyltoluene, and 1,2,4-trimethylbenzene

TABLE 1 Ignitable Liquid Classification Scheme[A]

Class	Light (C_{4}-$_{9}$)	Medium (C_8-C_{13})	Heavy (C_8–C_{20+})
Gasoline-all brands, including gasohol	Fresh gasoline is typically in the range C_4-C_{12}		
Petroleum Distillates (including De-Aromatized)	Petroleum Ether Some Cigarette Lighter Fluids Some Camping Fuels	Some Charcoal Starters[B] Some Paint Thinners Some Dry Cleaning Solvents	Kerosene Diesel Fuel Some Jet Fuels Some Charcoal Starters
Isoparaffinic Products	Aviation Gas Some Specialty Solvents	Some Charcoal Starters Some Paint Thinners Some Copier Toners	Some Commercial Specialty Solvents
Aromatic Products	Some Paint and Varnish Removers Some Automotive Parts Cleaners Xylenes, Toluene-based products.	Some Automotive Parts Cleaners Specialty Cleaning Solvents Some Insecticide Vehicles Fuel Additives	Some Insecticide Vehicles Industrial Cleaning Solvents
Naphthenic- Paraffinic Products	Cyclohexane based solvents/products	Some Charcoal Starters Some Insecticide Vehicles Some Lamp Oils	Some Insecticide Vehicles Some Lamp Oils Industrial Solvents
Normal-Alkanes Products	Solvents Pentane Hexane Heptane	Some Candle Oils Some Copier Toners	Some Candle Oils Carbonless Forms Some Copier Toners
Oxygenated Solvents	Alcohols Ketones Some Lacquer Thinners Fuel Additives Surface Preparation Solvents	Some Lacquer Thinners Some Industrial Solvents Metal Cleaners/Gloss Removers	
Others-Miscellaneous	Single Component Products Some Blended Products Some Enamel Reducers	Turpentine Products Some Blended Products Some Specialty Products	Some Blended Products Some Specialty Products

[A] The products listed in the various classes of Table 1 are examples of known commercial uses of these ignitable liquids. These examples are not intended to be all-inclusive. Reference literature materials may be used to provide more specific examples of each classification.

[B] Many of the examples can be prefaced by the word "some," as in "some charcoal starters."

iTeh Standards (https://standards.iteh.ai) Document Preview ASTM E1618-06e1 https://standards.iteh.ai/catalog/standard a41678e-d516-44a8-8b8d-c98c26b1c0b7/ast

7.2 Tune and calibrate mass spectrometer.

7.2.1 Tune the mass spectrometer using perfluorotributylamine (PFTBA), or another appropriate calibration standard, according to the instrument manufacturer's specifications, prior to use. This should be done at least every day that the instrument is used or per manufacturer's recommendations.

7.2.2 Maintain tuning documentation as a portion of the quality control documentation.

7.3 Cleaning the equipment.

7.3.1 Change septa and clean or replace injector liners on a periodic basis to avoid sample contamination by carryover of residual material from previous sample injections.

8. Sample Handling Procedure

8.1 Only samples of appropriate dilution should be analyzed on a GC/MS system.

8.2 Methods for isolating ignitable liquid residues from fire debris for analysis by this test method are described in Practices E1385, E1386, E1388, E1412, E1413, and E2154.

8.3 Due to the volatility of solvents and analytes, care must be taken to ensure that samples do not evaporate or otherwise change composition. Extracts in carbon disulfide may be covered with water prior to removing the extracts from the sample preparation hood. Alternatively, septum vials may be used for storing any solvents or extracts.

8.3.1 If water is used as a sealant, exercise care to avoid the introduction of water onto dimethlydichlorosilane (DMCS) treated columns.

8.3.2 Avoid the use of water as a sealant if the presence of water soluble compounds is suspected.

8.4 Analyze solvent blanks at least once each day that the instrument is used; maintain these analysis records. This will verify the purity of the solvent and potentially detect carryover or contamination.

8.5 Clean syringes thoroughly between injections to ensure no carryover.

8.5.1 Conduct carryover studies, and maintain records that demonstrate the adequacy of laboratory procedures to prevent carryover.

8.5.2 Running solvent blanks between each sample is not necessary if studies demonstrate that the cleaning procedure is adequate to prevent carryover.

8.6 Maintain reference files of known ignitable liquids that have been analyzed in the same manner as the questioned samples.

8.7 *Chromatogram Evaluation*—A good chromatogram for comparison work is one in which the peaks of interest are 50 to 100% of full scale. Rerun samples or re-plot chromatogram, using different parameters (attenuation or sample size) to achieve a good chromatogram.

8.7.1 In addition to the chromatogram described above, it is sometimes necessary to produce other, off-scale plots, in order to bring some features into view for comparison. Such off-scale plots may be required when there are one or more components present at a significantly higher concentration than the other components in the sample.

9. Data Analysis

9.1 Initial data analysis consists of a visual comparison of the total ion chromatograms to reference ignitable liquid chromatograms as described below.

9.1.1 The essential requirement for making a classification using this procedure is the matching of the sample chromatogram with a reference ignitable liquid chromatogram obtained under similar conditions, noting points of correlation or similarities.

9.1.2 The use of externally generated libraries of chromatograms is not sufficient for identification of an ignitable liquid. Such libraries are intended only to give guidance for selection of reference ignitable liquids.

9.1.3 Pattern matching requires that the entire pattern used for comparison be displayed at the same sensitivity.

9.1.4 The carbon number range is determined by comparing the chromatogram to a reference or test mixture containing known normal alkanes.

9.1.5 Additional data analysis may be carried out using extracted ion profiling (mass chromatography), target compound analysis, or both.

9.1.6 The compounds that comprise ignitable liquids consist of six major types: alkane (both normal and branched), alkene, cycloalkane, aromatic, polynuclear aromatic, and oxygenates. Other compounds may be present, but are not considered significant for the purposes of this method.

9.1.7 Compounds of each type produce characteristic major ion fragments. These ions are listed in Table 2.

9.2 *Extracted Ion Profiling (EIP)*:

9.2.1 A data station is used to extract and draw extracted ion profiles (mass chromatograms) for major ions characteristic of each compound type. Individual extracted ion profiles for two or more characteristic ions of the same functional groups or of similar magnitude may be summed to enhance the signal-to-noise ratio and to decrease interference by extraneous compounds that contain only one of the ions or to create summed profiles characteristic of specific classes of hydrocarbons.

9.2.1.1 Many data stations scale chromatograms so that the tallest peak is 100 % of full scale. It may be misleading to use a relative intensity display for ions of significantly different abundance. It is best to overlay these mass chromatograms or use an absolute intensity output.

9.2.2 Extracted ion profiles for an unknown sample are compared against the corresponding extracted ion profiles from reference ignitable liquids. This is generally done by visual pattern recognition as described in 9.1. Computerized pattern recognition techniques are also acceptable, provided the analyst visually verifies the results.

9.2.3 Major peaks in the extracted ion profiles should be identified by searching their mass spectra against a suitable library. The final identification must be made by the analyst on

TABLE 2 Major Ions Present in Mass Spectra of Common Ignitable Liquids^{A,B,C,D,E}

Compound Type	m/z
Alkane	43, 57, 71, 85, 99
Cycloalkane and alkene	55, 69
n-Alkylcyclohexanes	82, 83
Aromatic—alkylbenzenes	91, 105, 119; 92, 106, 120
Indanes	117, 118; 131, 132
Alkylnaphthalenes (Condensed Ring Aromatics)	128, 142, 156, 170
Alkylstyrenes	104, 117, 118, 132, 146
Alkylanthracenes	178, 192, 206
Alkylbiphenyls/acenaphthenes	154, 168, 182, 196
Monoterpenes	93, 136
Ketones	43, 58, 72, 86
Alcohols	31, 45

[A] Smith, R.M., "Arson Analysis by Mass Chromatography"*Analytical Chemistry*, Vol 54, No. 13, November 1982, pp 1399A–1409A.

[B] Kelly, R.L. and Martz, R.M., "Accelerant Identification in Fire Debris by Gas Chromatography/Mass Spectrometry Techniques", *Journal of Forensic Sciences*, Vol 29, No. 3, 1984, pp 714–722.

[C] Keto, R.O. and Wineman, P.L. "Detection of Petroleum-Based Accelerants in Fire Debris by Target Compound Gas Chromatography/Mass Spectrometry", *Analytical Chemistry*, Vol 63, No. 18, September 15, 1991, pp 1964–1971.

[D] Keto, R.O. "GC/MS Data Interpretation for Petroleum Distillate Identification in Contaminated Arson Debris", *Journal of Forensic Sciences*, Vol 40, No. 3, 1995, pp. 412–423

[E] McLafferty, F.W. and Turecek, F., Interpretation of Mass Spectra, 4th Edition, University Science Bools, Sausalito, California, 1993, pp. 233 and 247.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ASTM E1618-06e1
https://standards.iteh.ai/catalog/standards/sist/fa41678e-d516-44a8-8b8d-c98c26b1c0b7/astm-e1618-06e1

the basis of the mass spectra and relative retention times of the components in question by comparison to reference ignitable liquids.

9.3 *Target Compound Analysis (TCC)*:

9.3.1 Target compound analysis uses key specific compounds to characterize an ignitable liquid. These target compounds are listed in Table 3, Table 4, and Table 5.

9.3.2 Semi-quantitative ratios for the target compounds must be derived and compared against standards to ensure not only their presence but also that their chromatographic patterns match. Computerized pattern matching techniques are acceptable, provided the analyst visually verifies results.

9.3.2.1 Target compound pattern recognition may be improved by the production of target compound chromatograms, which are graphical representations of semi-quantitative peak areas for the target compounds. Target compound data may be plotted as a bar graph, with the *x*-axis representing retention time and the *y*-axis representing peak area. A single bar on the graph depicts each target compound.

9.3.2.2 Target compound chromatograms for unknown samples are compared to those generated for reference samples. The same pattern matching criteria for mass chromatography apply to target compound chromatography.

9.3.2.3 Major peaks in the TIC that are not accounted for by one of the target compound types may be identified by searching their mass spectra against a suitable library. The final identification must be made by the analyst on the basis of the mass spectra and relative retention times of the components in question by comparison to reference materials.

9.3.2.4 While TCCs provide much useful information, a TCC should not be the sole basis for the identification of an ignitable liquid residue.

10. Ignitable Liquid Classification Scheme

10.1 Seven major classes of ignitable liquids may be identified by gas chromatography, mass spectrometry, extracted ion profiling (or extracted ion profile analysis), or a combination thereof, when recovered from fire debris. These classes are outlined in 10.2. Typical total ion chromatograms of many of these classes are shown in Figs. 2-10.

10.1.1 This test method is intended to allow identified ignitable liquids to be characterized as belonging to one of the classifications. Distinguishing between examples within any class may be possible, but such further characterization is not within the scope of this test method.

TABLE 3 Gasoline Target Compounds

Compound	CAS Number
1. 1,3,5-Trimethylbenzene	108–67–8
2. 1,2,4-Trimethylbenzene	95–36–3
3. 1,2,3-Trimethylbenzene	526–73– 8
4. Indane	496– 11– 7
5. 1,2,4,5-Tetramethylbenzene	95– 93– 2
6. 1,2,3,5-Tetramethylbenzene	527– 53–7
7. 5-Methylindane	874– 35– 1
8. 4-Methylindane	824– 22– 6
9. Dodecane	112–40– 3
10. 4,7-Dimethylindane	6682– 71– 9
11. 2-Methylnaphthalene	91– 57– 6
12. 1-1–Methylnaphthalene	90–12– 0
13. Ethylnaphthalenes (mixed)	1127–76– 0
14. 1,3-Dimethylnaphthalene	575– 41– 7
15. 2,3-Dimethylnaphthalene	581–40–8

TABLE 4 Medium Petroleum Distillate (MPD) Target Compounds

Compound	CAS Number
1. Nonane	111–84– 2
2. Propylcyclohexane	1678–92–8
3. 1,3,5-Trimethylbenzene	108– 67–8
4. 1,2,4-Trimethylbenzene	95–36–3
5. Decane	124–18– 5
6. 1,2,3-Trimethylbenzene	526– 7–8
7. *n*-Butylcyclohexane	1678– 93– 9
8. Trans-decalin	493– 02– 7
9. Undecane	1120– 21– 4
10. 1,2,3,5-Tetramethylbenzene	527– 53–7
11. *n*-Pentylcyclohexane	4292– 92– 6
12. Dodecane	112– 40– 3
13. *n*-Hexylcyclohexane	4292– 75– 5

TABLE 5 Heavy Petroleum Distillate (HPD) Target Compounds

Compound	CAS Number
1. Decane	124–18–5
2. *n*-Butylcyclohexane	1678–93–9
3. Trans-decalin	493–02–7
4. Undecane	1120–21–4
5. 1,2,3,5-Tetramethylbenzene	527–53–7
6. *n*-Pentylcyclohexane	4292–92–6
7. Dodecane	112–40–3
8. *n*-Hexylcyclohexane	4292–75–5
9. 2-Methylnaphthalene	91–57–6
10. 1-1–Methylnaphthalene	90–12–0
11. Tridecane	629–50–5
12. *n*-Heptylcyclohexane	005617–41–4
13. 1,3-Dimethylnaphthalene	575–41–7
14. Tetradecane	629–59–4
15. *n*-Octylcyclohexane	1795–15–9
16. 2,3,5-Trimethylnaphthalene	2245–38–7
17. Pentadecane	629–62–9
18. *n*-Nonylcyclohexane	2883–02–5
19. Hexadecane	544–76–3
20. Heptadecane	629–78–7
21. Pristane	1921–70–6
22. Octadecane	593–45–3
23. Phytane	638–36–8
24. Nonadecane	629–92–5
25. Eicosane	112–95–8
26. Heneicosane	629–94–7

10.1.2 A miscellaneous category is included for those ignitable liquids that do not fall into one of the first seven major ignitable liquid classifications.

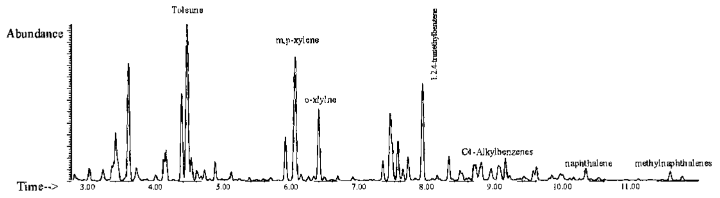
10.1.3 With the exception of the gasoline class, the major ignitable liquid classes may be divided into 3 subclasses based on boiling (*n*-hydrocarbon) range: Light, Medium and Heavy.

10.1.3.1 *Light product range*—C_4-C_9; the majority of the pattern occurs in the range C_4-C_9, no major peaks associated with the ignitable liquid exist above C_{11}.

10.1.3.2 *Medium product range*—C_8-C_{13}; narrow range products, the majority of the pattern occurs in the range of C_8-C_{13}, no major peaks associated with the ignitable below C_7 or above C_{14}.

10.1.3.3 *Heavy product range*—C_9-C_{20+}, typically broad range products, the majority of the pattern occurs in the range C_9–C_{23}, with a continuous pattern spanning at least 5 consecutive *n*-alkanes. Also included in the subclass are narrow range (encompassing less than five *n*-alkanes) ignitable liquid products starting above C_{11}.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ASTM E1618-06e1
https://standards.iteh.ai/catalog/standards/sist/fa41678e-d516-44[illegible]8c26b1c0b7/astm-e1618-06e1



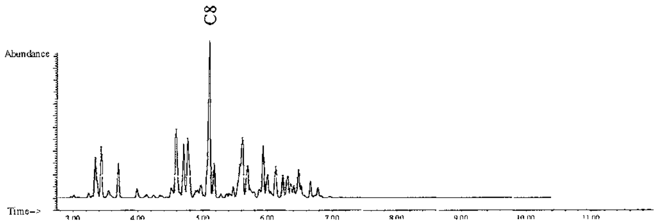
Chromatographic Conditions

Instrument: HP 5890 Gas Chromatograph
Detector: HP 5970 Mass Selective Detector
Column: 30 meter, Rtx-1 (polymethylsiloxane)
0.25mm ID, 0.25 micron film thickness
Sample: 1.0 microliter of 1% solution in pentane

Initial Temperature: 50C, 2.5 minutes
Rate: 15C/min
Final Temperature: 300C, 5.83 minutes
Total Run Time: 25.00 minutes
Split 20:1

NOTE: This is a typical chromatogram, provided for illustration only. Each laboratory is likely to obtain slightly different retention times and relative abundance of individual components, depending on sample history, separation procedure, and chromatographic conditions.

FIG. 2 Example of a Gasoline Pattern; 50 % Evaporated Gasoline



Chromatographic Conditions

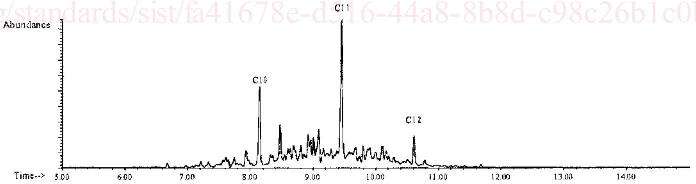
Instrument: HP 5890 Gas Chromatograph
Detector: HP 5970 Mass Selective Detector
Column: 30 meter, Rtx-1 (polymethylsiloxane)
0.25mm ID, 0.25 micron film thickness
Sample: 1.0 microliter of 1% solution in pentane

Initial Temperature: 50C, 2.5 minutes
Rate: 15C/min
Final Temperature: 300C, 5.83 minutes
Total Run Time: 25.00 minutes
Split 20:1

NOTE: This is a typical chromatogram, provided for illustration only. Each laboratory is likely to obtain slightly different retention times and relative abundance of individual components, depending on sample history, separation procedure, and chromatographic conditions.

FIG. 3 Example of a Light Petroleum Distillate; Cigarette Lighter Fluid

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ASTM E1618-06e1
https://standards.iteh.ai/catalog/standards/sist/fa41678e-d516-44a8-8b8d-c98c26b1c0b7/astm-e1618-06e1



Chromatographic Conditions

Instrument: HP 5890 Gas Chromatograph
Detector: HP 5970 Mass Selective Detector
Column: 30 meter, Rtx-1 (polymethylsiloxane)
0.25mm ID, 0.25 micron film thickness
Sample: 1.0 microliter of 1% solution in pentane

Initial Temperature: 50C, 2.5 minutes
Rate: 15C/min
Final Temperature: 300C, 5.83 minutes
Total Run Time: 25.00 minutes
Split 20:1

NOTE: This is a typical chromatogram, provided for illustration only. Each laboratory is likely to obtain slightly different retention times and relative abundance of individual components, depending on sample history, separation procedure, and chromatographic conditions.

FIG. 4 Example of a Medium Petroleum Distillate Pattern; 50 % Evaporated Mineral Spirits

10.1.3.4 It may be necessary to characterize a product as "light to medium," or "medium to heavy," when the carbon number range does not fit neatly into one of the above categories. In such instances, the carbon number range should be reported.

10.2 In order for an extract to be characterized as containing a particular class, the following minimum criteria must be met:

10.2.1 *Criteria for the Identification of Gasoline*:

10.2.1.1 *GENERAL*—All brands of gasoline including gasohol. Pattern characterized by abundant aromatics in a specific pattern.

10.2.1.2 *ALKANE*—Present. Pattern may vary by brand, grade, and lot.