



Standard Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction¹

This standard is issued under the fixed designation E1386; 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.

1. Scope

1.1 This practice covers the procedure for removing small quantities of ignitable liquid residue from samples of fire debris using solvent to extract the residue.

1.2 This practice is suitable for successfully extracting ignitable liquid residues over the entire range of concentrations.

1.3 Alternate separation and concentration procedures are listed in the referenced documents (Practices E1388, E1412, E1413, and E2154).

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

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.* For a specific hazard statement, see 5.5.

2. Referenced Documents

2.1 ASTM Standards:²

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

E1459 Guide for Physical Evidence Labeling and Related Documentation

E1492 Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory

E1618 Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry

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

E2451 Practice for Preserving Ignitable Liquids and Ignitable Liquid Residue Extracts from Fire Debris Samples

3. Summary of Practice

3.1 A sample of fire debris is extracted with an organic solvent. The extract is filtered and concentrated using dry nitrogen, filtered air, or inert gas.

4. Significance and Use

4.1 This practice is useful for preparing extracts from fire debris for later analysis by gas chromatography-mass spectrometry (GC/MS).

4.2 This is a very sensitive separation procedure, capable of isolating quantities smaller than 1 µL of ignitable liquid residue from a sample.

4.3 This practice is particularly useful when the potential for fractionation during separation must be reduced, as when attempting to distinguish between various grades of fuel oil.

4.4 This practice is particularly useful for the extraction of nonporous surfaces such as glass, or the interior of burned containers. It is also particularly well suited to the extraction of materials from very small samples.

4.5 This practice can be hampered by coincident extraction of interfering compounds present in the fire debris samples.

4.6 This practice may not be useful for the extraction of some extremely volatile ignitable liquids, which may evaporate during the concentration step.

4.7 This is a destructive technique. Whenever possible, this technique should only be used when a representative portion of the sample can be reserved for reanalysis. Those portions of the sample subjected to this procedure may not be suitable for

¹ This practice is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of E30.01 on Criminalistics

Current edition approved Feb. 1, 2010 Published March 2010. Originally approved in 1990. Last previous edition approved in 2009 as E1386 – 09. DOI: 10.1520/E1386-10.

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.

resampling. If destruction of the sample is an issue, consider using passive headspace concentration as described in Practice [E1412](#).

5. Reagents and Materials

5.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. 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.³ 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.

5.2 *Solvent*—A suitable solvent, such as carbon disulfide, pentane, petroleum ether, or diethyl ether.

5.2.1 Check solvent purity by evaporating to at least twice the extent used in the analysis and analyzing the evaporated solvent in accordance with Test Method [E1618](#).

5.2.2 Read and follow the safety precautions described in the material safety data sheet (MSDS) of the extraction solvent that is used.

5.3 *Filter paper*, free of extractable hydrocarbons.

5.4 *Beakers and vials*, free of extractable hydrocarbons.

5.5 *Compressed Dry Nitrogen, Filtered Air, or Inert Gas*. (**Warning**—These gases are stored under high pressure.)

6. Procedure

6.1 Observe the appropriate procedures for handling and documentation of all submitted samples as described in Practices [E1492](#) and [E1413](#).

6.1.1 Open and examine the fire debris sample in order to determine that it is consistent with its description.

6.1.1.1 Resolve any discrepancies between the submitting agent's description of the evidence and the analyst's observation with the submitting agent prior to the completion of the report.

6.2 Select a beaker size which is capable of holding twice the volume of the sample.

6.3 If possible, select a representative portion of the sample to extract.

6.3.1 Record in the case notes a description of the portion of the sample extracted.

6.3.2 If only a portion of the sample is subjected to extraction, include in the report a description of the portion of the sample which was extracted.

6.4 Add sufficient solvent to thoroughly moisten the sample.

6.5 The next smaller size beaker may be used as a plunger to promote extraction of flexible debris.

6.6 Mix the solvent and debris. An extraction time of less than one minute is usually sufficient.

6.6.1 Simple rinsing of nonporous surfaces may be sufficient for adequate separation of residues.

6.7 Decant the solvent and filter if necessary.

6.8 Evaporate the solvent with dry nitrogen, filtered air, or inert gas, without heat, to a volume of approximately 1 mL.

6.8.1 Sufficiently concentrated samples do not require evaporation.

6.9 Code or label an appropriately sized vial in accordance with Guide [E1459](#).

6.10 Transfer the solvent into the prepared container and seal.

6.11 Follow the evidence documentation and handling procedures described in Guide [E1459](#) and Practice [E1492](#).

6.12 Follow the extract storage procedures described in Practice [E2451](#).

7. Keywords

7.1 fire debris samples; solvent extraction

³ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC, www.chemistry.org. For suggestions on the testing of reagents not listed by the American Chemical Society, see the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD, <http://www.usp.org>.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT/).