

# **Standard Practice for the Collection and Preservation of Organic Gunshot Residue**

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and Preservation of Organic Gunshot  
Residue**

Prepared by  
Ignitable Liquids, Explosives, & Gunshot Residue Subcommittee  
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## **Standard Practice for the Collection and Preservation of Organic Gunshot Residue**

### **1. Scope**

- 1.1. This standard practice describes procedures for the sampling and preservation of organic gunshot residues (OGSR) recovered from hands, skin, clothing, and other substrates. This standard practice does not apply to the analysis or interpretation of OGSR, or inorganic gunshot residue (IGSR).
- 1.2. This standard practice cannot replace knowledge, skill, or abilities acquired through appropriate education, training, or experience (Practice E2917), and should be used in conjunction with professional judgement by individuals with such discipline-specific knowledge, skills and abilities.
- 1.3. This standard practice 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:

- 2.1.1. E1492 Standard Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory
- 2.1.2. E1588 Standard Practice for Gunshot Residue Analysis by Scanning Electron Microscopy/Energy Dispersive X-Ray Spectrometry.
- 2.1.3. E1732 Standard Terminology Relating to Forensic Science
- 2.1.4. E2917 Standard Practice for Forensic Science Practitioner Training, Continuing Education, and Professional Development Programs.
- 2.1.5. E2998 Standard Practice for Characterization and Classification of Smokeless Powders.
- 2.1.6. E2999 Standard Test Method for Analysis of Organic Compounds in Smokeless Powder by Gas Chromatography-Mass Spectrometry and Fourier Transform Infrared Spectroscopy
- 2.1.7. WK56998 Standard Terminology Relating to the Examination of Explosives.

### **3. Terminology**

Definitions – For definitions of terms that can assist in interpreting this standard, refer to Terminology E1732 and WK 56998.

Definitions of terms specific to this standard”

- 3.1.1. *Inorganic GSR (IGSR), n* – Residues from the primer, cartridge case, projectile (e.g., bullet or shot pellets), and/or the firearm that are primarily made of metal, metal oxides, or metal salts.

- 3.1.2. *Organic GSR (OGSR), n* – Residues from the propellant and the priming mixture that are organic compounds.
- 3.1.3. *Primer GSR (PGSR), n* –Residues generating from the priming mixture that could be inorganic or organic in nature.
- 3.1.4. *Stubbing, v* – Act of pressing adhesive tape onto a surface to be sampled using a collection stub; synonymous with dabbing or tape lifting.

#### **4. Significance and Use**

- 4.1. The most common reason that gunshot residue (GSR) examination is performed is to determine if an individual was exposed to firearm discharge. Traditional GSR analysis has relied upon the detection of inorganic GSR primarily originating from the ammunition primer (PGSR) as described in Practice E1588; however, OGSR provides information that complements PGSR analysis [1]. This standard practice is of use to forensic laboratories desiring to supplement PGSR analysis with OGSR analysis to identify surfaces exposed to gunshot residue.
- 4.2. OGSR originates from the combustion of the smokeless powder and the priming mixture following their ignition during the firearm discharge process. After a firearm has been discharged, the combined residue can be found on exposed surfaces in the vicinity of the fired weapon (e.g., hands, other exposed skin surfaces, hair, clothing, and other surfaces). OGSR can also be found in the cartridge case after firing and can be recovered to provide information about the constituents of the propellant or the priming mixture, or both.
- 4.3. This standard provides guidance on best practices and should always be verified in conjunction with a laboratory's standard operating procedures.
- 4.4. Sampling from individuals suspected to have discharged a firearm may be subject to legislation in some jurisdictions.
- 4.5. This standard does not apply to the analysis of intact smokeless powder grains. Refer to Practice E2998 and Test Method E2999 for the characterization of intact smokeless powder grains.

#### **5. Materials**

- 5.1. Purity of Reagents – Gas chromatography-mass spectrometry (GC-MS) grade, liquid chromatography-mass spectrometry (LC-MS) grade or higher-grade chemicals shall be used in the collection of OGSR. 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 [1]. Other grades can be used if the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.
- 5.2. Sample Collection Solvents – Acetone, acetonitrile, ethanol, isopropanol, methanol or other appropriate solvents.
- 5.3. Sample Storage Containers – Containers for storing the collection media shall be airtight in order to reduce the loss of sample due to evaporation.

- 5.4. Adhesive Tape Lifts – Suitable adhesive tapes include those used for scanning electron microscope (SEM) sample stubs. Other adhesive tapes can be used, provided that their effectiveness and suitability for OGSR collection is validated prior to use [2,3].
- 5.5. Swabs – Suitable swabs include cotton, polyester, muslin, and nylon-based substrates [1,4,5].
- 5.6. Vacuums – A suitable vacuum shall be fitted with an inert filter membrane, such as polytetrafluoroethylene (PTFE) and fiberglass filters, with a maximum porosity of 0.5  $\mu\text{m}$  to trap particles, [1,6].

## 6. Procedure

- 6.1. There are three commonly accepted sampling techniques for OGSR: adhesive tape lifting, swabbing, and vacuuming. Each technique differs in its collection efficacy [4]. Consider the surface to be sampled when choosing a sampling technique.
  - 6.1.1. Adhesive tape lifting can be used to sample from many dry surfaces, including skin and clothing.
  - 6.1.2. Swabbing can be used to sample from skin surfaces (e.g., hands, face, neck) or inanimate objects (e.g., tables, vehicles, clothing). This technique is appropriate for either wet or dry surfaces.
  - 6.1.3. Vacuuming can be used to sample textile objects (e.g., clothing, carpeting, etc.).
- 6.2. Use a separate sampling device for each surface (e.g., left hand and right hands) to maximize sample recovery [4,6].
- 6.3. Adhesive tape lifts
  - 6.3.1. Adhesive tape lifts used for SEM sample stubs effectively collect OGSR from many surfaces, including skin, clothing, and objects. Other adhesive tapes can be used at the discretion of the individual laboratory. The effectiveness and suitability of other adhesive tapes should be validated prior to use.
  - 6.3.2. Dab the adhesive surface portion of the stub onto the surface to be sampled until tackiness is lost to achieve maximum collection efficiency [7].
- 6.4. Swabbing
  - 6.4.1. Use dry or wet swabs to collect samples from the surface of interest.
    - 6.4.1.1. If wet swabbing, suitable solvents include ethanol and isopropanol.
      - Note (1): Acetone and acetonitrile are not recommended for extended contact with skin.
      - Note (2): Certain solvents can dissolve other compounds in the swab material that could interfere with the analysis. [4,5,6]
  - 6.4.2. If a surface is also to be stubbed for recovery of IGSR, perform the adhesive tape stubbing first and then swab the sample to collect OGSR residue [4].
- 6.5. Vacuuming
  - 6.5.1. Prior to vacuuming the textile sample, dab the adhesive on the sample using the procedure in section 6.3.1 to collect IGSR [8].

**6.5.2.** Vacuum the area of interest thoroughly, to obtain a sample that is as representative as possible, following standard operating procedures of the vacuum.

**6.6. Preservation of OGSR Samples**

**6.6.1.** Store sample collection media (e.g., adhesive lifts, swabs, or vacuum filters) in an airtight container immediately to reduce possible loss due to evaporation.

**6.6.2.** Store samples at 0°C or lower to maximize preservation.[4,5]

**7. Documentation**

7.1. Using hardcopies or electronic format, obtain and retain the following for a period of time as determined by the individual laboratory:

7.1.1. Field notes from the collection of OGSR, including but not limited to the materials used for collection, location of the surfaces sampled, time elapsed between shooting incident and sample collection, and the storage procedure employed immediately after collection.

7.1.2. Laboratory notes about the handling of the OGSR sample, including but not limited to how the sample was stored upon arrival at the laboratory, duration of the time the samples were stored from receipt and prior to analysis.

**8. Keywords**

8.1. OGSR; Collection; Preservation

**9. References**

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