

**CHEM-06 SEM Sample Collection from Evidence for
Gunshot Residue Analysis**

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Approved by Director: Dr. Guy Vallaro

1. Purpose

To collect samples for the possible presence of primer gunshot residue (pGSR/GSR).

2. Responsibility

Analysts authorized to perform SEM sample collection for GSR analysis.

3. Equipment

- a. Scanning electron microscope (SEM) (Hitachi or equivalent)
- b. Energy dispersive X-ray spectrometer (EDS) with GSR software (EDAX or equivalent)
- c. SEM stubs with carbon adhesive (SEM/GSR stubs)
- d. Deionized water (DI H₂O) (or equivalent)
- e. Isopropanol (reagent grade or better) (or equivalent)
- f. Tweezers and other appropriate laboratory tools/equipment
- g. Digital camera

4. Procedure:

a. Preparation

- i. All evidence is handled in accordance with general laboratory (GL) policy.
- ii. Appropriate case notes will be taken and recorded within LIMS or on worksheets.
- iii. Sampling of evidence for GSR will not occur within the SEM laboratory room/space.
- iv. Perform a visual examination of the evidence, taking photographs to capture the condition of the evidence, its packaging, and any relevant markings or labels. Photographs of the exterior of the evidence packaging should be taken prior to the evidence being opened or unsealed by the Chemistry Unit.

b. Sample Collection

- i. All items packaged separately will be sampled separately.
- ii. Items packaged together and in contact with one another should be considered the same item and will be sampled together (as one item, with or without multiple sub-items).
- iii. Any areas of evidence sampled, and their associated SEM stubs, will be appropriately recorded within LIMS or on worksheets. The FSE 2 (or higher) will be consulted for any atypical situations/evidence.
- iv. Evidence removed from its packaging is not to come into contact with surfaces that have not been previously cleaned with isopropanol and allowed to fully dry and also covered with an appropriate barrier layer (e.g. craft paper) to prevent contamination. Appropriate cleaning of the examination area will be conducted in between different items of evidence.
- v. Examination gloves will be changed in-between cleaning, handling, and sampling of evidentiary items.

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- vi. A new barrier layer will be placed between evidence and surfaces.
- vii. To serve as a negative control, a new SEM stub will be placed within the same general area where evidence sampling/examination will occur. The negative control stub will be left open within its holder, upright, and exposed to the same sampling/examination environment. The negative control will be labeled to indicate the associated item of evidence. Once sampling/examination of the item of evidence is complete, cap/seal the negative control stub. A separate negative control will be taken for each item sampled.
- viii. Additional sampling of evidence (e.g., for Forensic Biology/DNA section) may occur at the same time as sampling for GSR examination. Such sampling will be done by appropriately-trained analysts and according to relevant procedures within that section.
- ix. Evidence exhibiting damage/defects (e.g., holes, cuts, stains, etc.) should be noted.
- x. A general sampling for GSR particles using new SEM stubs will be performed.
 - 1. Clothing items
Use new SEM stubs to sample clothing items. The same stub can be used for multiple areas of the same item (as long as the adhesiveness of the stub is still effective). The following are recommended sampling areas:
 - a. Pants/shorts: Sample the outside/inside of pockets.
 - b. Long sleeve garments: Sample the front side, sleeve cuffs, and the outside/inside of pockets.
 - c. Short sleeve or sleeveless garments: Sample the front side.
 - d. Shoes, hats, accessories, etc.: Sample the outside surfaces.
 - e. Underwear and inner garments: Not typically sampled.
 - 2. Swabs
When swabs are submitted for GSR analysis, the FSE 2 (or higher) will be notified. The submitting agency will be informed that swabs are not routinely analyzed and to refrain from submitting swabs in the future. When approved by the FSE 2 (or higher), a best attempt will be made to sample the swabs using new SEM stubs. Note: Typically, this will only occur if no other appropriate evidence is available to be analyzed or sampled for GSR.
 - a. A new SEM stub will be used to sample each swab that needs analysis.
 - b. Any fibers from the swab on the SEM stub should be removed. If tweezers (or other reusable laboratory equipment/tools) are used, they will be cleaned with DI water and isopropanol prior to reuse.
 - 3. Additional types of evidence will be sampled according to the best judgement of the analyst and FSE 2 (or higher). The same SEM stub can be used for multiple areas of the same item (as long as the adhesiveness of the stub is still effective).

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- c. Analysts may seek guidance from the FSE 2 (or higher) when reporting results or needing to update item descriptions.

5. References

General Laboratory (GL) and Section/Unit procedures

ASTM Standards E1588 and E3309

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