A. Purpose

The Sodium Rhodizonate test is used to identify lead residue on an item that may have been present during the discharge of a weapon. The Sodium Rhodizonate test is a direct application to a surface to test for the presence of lead residue.

B. Responsibility

Analysts assigned to the Firearms Section or analysts competent in distance determination.

C. Safety

| **Listings** | | | | |
|---|---|---|---|---|
| **Chemical** | **Health Hazard** | **Flammability Hazard** | **Reactivity Hazard** | **Specific Hazard** |
| Sodium Rhodizonate | 0 | 0 | 0 | |
| Sodium Bitartrate | 0 | 0 | 0 | |
| Tartaric Acid | 2 | 0 | 0 | |
| Hydrochloric acid | 3 | 0 | 0 | |
| | | | | |

The analyst shall use PPE such as gloves, eye protection and lab coat when making and using these chemicals.

D. Reagent Preparation Procedure

Preparation of Sodium Rhodizonate Solution

1. Place a small amount of sodium rhodizonate in a small beaker and add distilled $H_2O$ and mix until all of the powder is dissolved. The solution should be the color of strong tea. Repeat until the solution is saturated (small amount of powder remains on bottom after mixing).
2. Prepare enough solution for that day of testing. The solution is not suitable for long-term storage.

Preparation of 2.8 pH Buffer Solution

1. Using hot plate and a magnetic stirrer, dissolve 1.9 grams (29.32 grains) of sodium bitartrate and 1.5 grams (23.15 grains) of tartaric acid in 100 mL of distilled $H_2O$.
2. Store this solution in a sealed bottle. The shelf life of this solution is one year; however, it may be discarded earlier if cloudiness is observed.

Preparation of 5% Hydrochloric Acid Solution

1. Add 5 mL of hydrochloric acid to 95 mL of distilled $H_2O$.
2. Store in a sealed bottle. The shelf life of this solution is one year from the date of preparation.

E. Testing Procedure

Direct Application Procedure

1. Transfer an adequate amount of saturated sodium rhodizonate solution into a labeled spray bottle.

   Transfer an adequate amount of tartaric acid/sodium bitartrate buffer solution into a labeled spray bottle.

   Transfer an adequate amount of 5% hydrochloric acid into a labeled spray bottle.

2. Reagent control check:

   On a piece of filter paper, create a faint mark by rubbing a lead bullet. The unmarked area of this filter paper will be used as the negative control.

   Spray the filter paper in the following order: sodium rhodizonate solution, tartaric acid/sodium bitartrate and 5% hydrochloric acid. A purple color should only appear in the location of the faint mark. The purple color would indicate a positive result. No purple color in the other areas indicates that the negative control worked properly.

2. With the item laid out flat, spray the questioned area with the sodium rhodizonate solution.

3. Spray the same area with tartaric acid/sodium bitartrate buffer solution. This solution will eliminate the yellow background color that was produced by the sodium rhodizonate and will also adjust the pH to 2.8. A pink color will appear if there is lead particles/vapor or other metals present.

4. Spray the same area with the 5% hydrochloric acid. The pink color will fade and a blue-violet color will develop if lead particles/vapor or bullet wipe is present. It should be noted that this blue-violet color may fade; therefore, photographic documentation should be conducted as soon as possible.

5. Allow the evidentiary items and test shots to dry completely.

Bashinski Transfer Method

The Bashinski Transfer Method is recommended for dark colored items in which the blue-violet color development may be masked.

1. Place a piece of filter paper over the questioned area of the item of evidence. Using a pencil, index the filter paper relative to the garment using holes, seams, buttons, pockets, etc.

2. Uniformly dampen the filter paper with the 15% of glacial acetic acid (refer to the Modified Griess Reagent SOP for preparation) while it is lying on the questioned area.
3. Cover the dampened filter paper with several layers of dry filter paper. Apply a hot iron and press until all layers of the filter papers are dry.
4. Separate the filter paper that was in direct contact with the evidentiary item and process it the same manner as the direct application method.
5. Any test shots should also be processed with the Bashinski Transfer Method.
6. Allow the evidentiary items and test fires to dry completely.

E. Other Considerations

Environmental lead may produce false positive results; the examiner will consider the resulting patterns when interpreting the products of the reactions.

F. References

Anon., (1970). "Gunshot Residues and Shot Pattern Test", F.B.I. Law Enforcement Bulletin, Vol. 39, No. 9, p. 7.

Dillon, John, H., "A Protocol for Gunshot Residue Examinations in Muzzle-To-Target Distance Determinations", AFTE Journal, 1990. Vol. 22, No. 3, p. 32.

Dillon, John, H., "The Sodium Rhodizonate Test: A Chemically Specific Chromophoric Test for Lead in Gunshot Residues", FBI – Gunpowder and Gunshot Residue Manual, p. 57.