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**Appendix**  
**Shoewear/Tiretrack SOP**

### Reagent Formulas

#### 1. 8-Hydroxyquinoline

**Synonym: 8-Quinolinol**

Dissolve 0.5 g 8-hydroxyquinoline with stirring in 100 ml 90:10 v/v acetone:water.

Application: View in 254/365 nm UV light.

Theory: fluorescent chelates formed with certain metal ions such as  $Mg^{++}$  and  $Ca^{++}$ .

Quality assurance: Test with known marks made with chalk dust. A purple fluorescence within the chalk indicates positive reaction.

#### 2. Iodine

Place iodine crystals in airtight chamber, along with the item to be fumed. A source of heat, approximately 37° C, and humidity must be included. The reaction should occur within a few minutes. Photograph the developed impression to preserve the enhancement.

#### 3. 7,8-benzoflavone 0.2%

**Synonym: alpha-naphthoflavone**

Dissolve 0.2 g 7,8-benzoflavone in 2 to 3 ml chloroform. Make up to 100 ml with petroleum ether.

Application: An enhancement for iodine fuming. First fume the item with iodine crystals in a sealed tank. Follow with a 10-second dip in the benzoflavone reagent, or spray.

Theory: Absorbed by a range of organic materials.

Quality assurance: Spray a known mark in starch. Positive result is a purple color.

#### 4. Ammonium thiocyanate 2%

**Note: Ammonium thiocyanate is a hazardous material. In contact with strong acid it generates cyanide gas. The hazardous nature of this material seems to have been neglected in a number of published references relating to shoeprint enhancement.**

Prepare and use the reagent in a hood.

For safety, do not store or use in a closed container/sprayer.

The following procedure produces a reagent that works very well:

Mix 40 ml of acetone and 10 ml nitric acid. The mixture should be warm to the gloved hand but not hot. Allow time for cooling.

Dissolve 2 g ammonium thiocyanate in 50 ml of acetone.

Slowly add the ammonium thiocyanate/acetone mixture to the acetone/nitric acid; mix.

There may be a few bubbles formed; when these have cleared the reagent is ready for use.

There is no shelf life for this mixture; prepare just before use and discard.

Application: Spray with an open sprayer (not air tight). Use a fine mist or spray. The reaction product is water-soluble; great care required with non-absorbent surfaces.

Theory: Soluble deep red product with  $Fe^{+++}$  ions.

Quality assurance: Spray a known mark made with iron salts. Red reaction indicates a positive result.

#### 5. Small particle reagent

**Nonporous surfaces; especially effective for use on wet items**

Note: This reagent is described as "extremely messy".

Reagent: 30 g molybdenum disulfide added to one liter distilled water. Add 2 (no more) drops of Kodak Photo Flo 200, shake the mixture well. It may be necessary to shake for 3 to 5 minutes; it is not ready to use if any powder is floating on the surface.

Application: Tray immersion, 2 minutes, or spray. Rinse with water; allow to dry.

Theory: Particles adhere to oily material in the impression.

Quality assurance: Test against an oily deposit.

#### 6. Physical developer

**Porous surfaces, especially paper**

**May be used after iodine or ninhydrin processing**

Reagent: May be mixed in the laboratory, see Bodziak, 2<sup>nd</sup> edition, or purchased commercially from Lightning<sup>®</sup> Powder Company.

Application: Metal forceps, rubber gloves, or bare fingers may leave deposits on the item; handle with non-serrated plastic forceps or cotton gloves.

Theory: Reacts with fats, oils, waxes present in the impression.

### 7. 5-Sulfosalicylic acid for fixing bloody impressions

Reagent: 20 g 5-sulfosalicylic acid in 1 liter water.

Application: Immerse the item in the solution for 10 minutes; then immerse in distilled water for 5 minutes. Large areas such as floors may be sprayed.

Theory: Chemical fixing ensures the bloody impression is not washed away during chemical enhancement.

### 8. Leucomalachite green

Reagent: 0.06 g leucomalachite green (kept in dark, room temperature)  
0.2 g sodium perborate  
20 ml alcohol  
10 ml glacial acetic acid  
Wrap a stopper with parafilm, stopper flask tightly, shake vigorously for one minute.  
Add 100 ml 1,1,1-trichloroethane; mix well.

Application: Spray surface lightly 2 or 3 times, holding sprayer 14 inches or more from surface.  
Photograph the developed prints; they will fade.

Theory: Green reaction with blood. Doesn't color background.

Quality assurance: Spray a known blood spot. Positive result: green color.

### 9. Amido black

Synonym: Naphthalene black

Non-porous surfaces

Reagents (three solutions): Dye solution: Amido black 0.2 g  
Glacial acetic acid 10 ml  
Methanol 90 ml

Rinse solution 1: Glacial acetic acid 10 ml  
Methanol 90 ml

Rinse solution 2: Glacial acetic acid 5 ml  
Methanol 98 ml

Application: Fix the impression with 5-sulfosalicylic acid.  
Apply the dye solution, allow to react for 2 minutes.  
Apply rinse solutions.

Theory: This is a protein stain that reacts with blood.

Quality assurance: Test against known blood.

#### **10. Fingerprint Powders**

**Smooth, waxed, polished, non-porous surfaces**

**Not suitable for porous or textured surfaces**

Conventional powders

Fluorescent powders, applied while using ALS/UV light

#### **11. Dental stone**

**Casting material**

The amount of water to be added to the dry powder is indicated by the manufacturer as ml water/100 g powder. Our pre-weighed bags of dental stone contain approximately 700 g powder. If no information is readily available, start with 26 ml water/100 g powder, mix for 3 minutes. If the mixture is still too thick for easy pouring, add 15ml additional water.

References: Next page

#### **References**

Bodziak, William J. 2000. Footwear impression evidence: detection, recovery, and examination; Edition 2. New York: CRC Press.

Chesapeake Area Shoeprint and Tire track website:

<http://members.aol.com/varfee/mastssite/home.html>

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