Physical Developer

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Physical Developer

1 Introduction/Scope

Physical Developer is used by FBI Laboratory Friction Ridge Discipline personnel to develop latent prints on porous and semi-porous surfaces.

2 Standards and Controls

See *Processing Overview* (FRD-300).

3 Limitations

A. All metal items, such as staples and paper clips, must be removed from item(s) prior to Physical Developer processing.
B. Metal tweezers cannot be used during processing.

4 Equipment

- Citric Acid
- Maleic Acid
- Silver Nitrate
- Bleach
- Synperonic N or Tween 20
- Ferrous Ammonium Sulfate
- n-Dodecylamine Acetate
- Ferric Nitrate

5 Procedure

5.1 Solution Preparation

Personnel will prepare the solutions as follows. Alterative amounts may be prepared, provided the same ratio of chemicals mixed is retained.

5.1.1 Maleic Acid solution

A. Combine:
    - Maleic Acid - 25 g
    - Distilled water - 1000 mL
B. Stir until solid dissolves.

5.1.2 Redox solution

In the order listed below, stir until each solid is dissolved before adding the next solid:

- Distilled water - 1000 mL
- Citric Acid - 20 g
- Ferric Nitrate - 30 g
- Ferrous Ammonium Sulfate - 80 g

5.1.3 Detergent solution

A. Combine:
   - n-Dodecylamine Acetate - 3 g
   - Synperonic N or Tween 20- 4 g
   - Distilled water - 1000 mL

B. Stir until all chemicals dissolve.

5.1.4 Silver Nitrate solution

A. Combine:
   - Silver Nitrate - 200 g
   - Distilled water - 1000 mL

B. Stir until solid dissolves.

5.1.5 Physical Developer working solution

A. While stirring, combine in the order listed:
   - Redox solution - 1000 mL
   - Detergent solution - 40 mL
   - Silver Nitrate solution - 50 mL

B. Stir for at least three minutes.

5.1.6 Bleach solution (optional)

Combine:

- Bleach - 500 mL
- Distilled water - 500 mL

5.2 Application

Personnel will complete the following steps in order:

A. Immerse item(s) in Maleic Acid solution.
B. Agitate solution, manually or with orbital shaker, for a minimum of 15 minutes.
C. Immerse item(s) in Physical Developer working solution.
D. Agitate solution, manually or with orbital shaker, for 10-15 minutes.
E. Immerse item(s) in first water rinse for at least 1 minute.
F. Rinse item(s) in second water rinse.
G. Dry item(s) in air or by applying heat with an iron, heater, or dryer.
H. Capture appropriate friction ridge detail as applicable (digitally or photographically).

5.2.1 Bleach Solution Rinse (Optional)

A. The bleach solution may darken latent prints developed with Physical Developer, lighten the background, and remove any previous processing stains that may still be present on the item.
B. The bleach solution is especially effective on paper bags and paper currency.

C. The solution is usually applied after the second water rinse but can be done after the item has been dried.
D. Personnel will complete the following steps in order:
    1. Immerse item(s) in Bleach solution for 10-15 seconds or until desired contrast is achieved.
    2. Rinse item(s) in water.
    3. Dry item(s) as described above.

5.3 Storage

A. Maleic Acid, Redox, Detergent, and Bleach solutions may all be stored in any type of laboratory acceptable receptacle.
B. Silver Nitrate solution must be stored in a dark bottle.
C. Physical Developer working solution is not stored. It is prepared as needed.

5.4 Shelf Life

A. Maleic Acid, Redox, and Bleach solution have indefinite shelf lives provided the reagent checks are satisfactory.
B. Detergent and Silver Nitrate solution each have a shelf life of 1 year provided the reagent checks are satisfactory.
C. Physical Developer working solution is not retained. It is prepared as needed.

6 SAFETY

See FBI Laboratory Safety Manual for appropriate information.

7 REVISION HISTORY

Revision	Issued	Changes
03	07/15/2021	Replace Latent Print Units with Friction Ridge Discipline. Minor wording changes. Streamline equipment list. Re-organization and re-numbering of sections. Section 4.4 - broken into Section 4.1.1, Section 4.1.2, Section 4.1.3, Section 4.1.4, Section 4.1.5, and Section 4.1.6. Parts of Section 4.2 - broken into Section 4.2.1 and Section 4.2.2. Section 4.1 - added ratio allowance. Section 4.1.6 - moved note. Section 4.2 - removed note. Section 5 - added Preamble
04	07/01/2022	Format Updated. Section 1 – Scope updated.