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TECHNICAL INFORMATION

Physical Developer

Catalog Nos. LPD100, LPD101

Background and Purpose

Physical Developer is a silver-based aqueous reagent that reacts with components of sebaceous oils to form a silver/gray deposit. It should not be used as a primary method of latent print development; rather, it is used as a follow up to processing with DFO and/or Ninhydrin. Since it reacts with sebaceous compounds, it is often likely that additional prints or detail will develop that were not discovered when using other processes that react with amino acids.

The effectiveness depends on close observation of impression development, background development and the conditions of the processing solutions.

Items and Surfaces

The process is effective on porous and semi-porous surfaces such as paper currency, paper, cardboard, raw wood, tissue paper, paper based adhesive tapes and some man-made fibers. It can be used on surfaces that are wet, or have been wetted and subsequently dried.

Health / Safety

Notice: The products identified in this Technical Information Sheet should not be use without thoroughly reviewing each product's Safety Data Sheet which can be found at www.sirchie.com/support.

Physical Developer can be used safety and effectively when used in a controlled environment and in adherence with standard laboratory safety guidelines.

Warning: Silver nitrate and the solutions containing this chemical can irritate eyes, mucus membranes and skin. Prepare and use in well-ventilated areas and preferably in the confines of a fuming hood. Use chemical resistant gloves and safety glasses when handling chemical products.

Suggested Equipment

Forceps / Tongs: Used to move items during processing

- Smooth and **non-metallic**
- Should not have serrated or sharp edges or ridges

Fuming Hood (Vented or ductless): The safe and effective preparation of Physical Developer Solutions and processing solutions requires the use of a fuming hood (vented or ductless). Sirchie's AirSafe™ Basic and Advanced Forensic Workstations (Sirchie Catalog AC600 series) are specially designed to meet and exceed applicable OSHA and ANSI standards for ductless enclosures.

Glass Beakers: Used to mix processing formulas

- 1000/2000 ml graduated laboratory grade beakers
- Must be thoroughly cleaned before use

Glass Processing Dish: The glass processing dish must:

- Be scratch free
- Be large enough to process the item without folding (i.e., Pyrex type 15"l x 10"w x 2"d)
- Must be thoroughly cleaned before use

Magnetic stirrer, magnetic follower and magnetic retriever

Bench Rocker (Sirchie BR110)

Shatter proof "dark" containers – 1 liter: Used to store unused solutions.

Maleic Acid Solutions

Special Consideration: Safety and effectiveness issues apply requiring the use of proper protective clothing and preparation of the solutions in a well-ventilated area and preferably in the confines of a fuming hood

The Maleic Acid Solution, if indicated, is used prior to Physical Developer processing as a pre-treatment to neutralize alkaline binders and fillers which may react strongly with the Physical Developer process.

Maleic Acid Solution using Sirchie Catalog No. LPD110L

This 1000 ml pre-mixed Maleic Acid Solution is ready for immediate use in accordance with the directions set forth in the Procession Section.

Store in bottle supplied

Shelf Life: 18 months

Maleic Acid Solution using Sirchie Catalog No. LPD110 (50 grams)

Formulation:

- Place 500 ml of distilled water in a clean 1000 ml glass beaker with a magnetic follower.
- Add 25 grams of maleic acid to the distilled water and stir to ensure the solution is thoroughly mixed. The solution should be colorless.
- Transfer the solution to a dark, shatter-proof container and properly label.
- Unused maleic acid solution may be stored at room temperature for 18 months.

Physical Developer Solution

Sirchie supplies Physical Developer in two-part, pre-mixed containers. Container "A" contains the silver nitrate solution and container "B" contains the redox/detergent solution. Mixing instructions will be set forth in the Processing Section.

Physical Developer Processing

Physical Developer is a complex chemical process that may involve exposing the item or surface to three to four separate solutions in sequence. **The processor should process a self-made test print concurrently with the items of interest.** Sirchie's Latent Print Standards Pad, Catalog No. LPSP200, contains components which included sebaceous oils and salts and will provide a true standard test print.

Note: The distilled water and all solutions used in the Physical Developer process must be between 17º C and 23º C (62.5º F and 73.4º F). All glassware and magnetic stirrers used in the process must be cleaned thoroughly. Wipe all internal surfaces of beakers with paper towels under cold tap water and rinse with distilled water before use.

Step #1. Distilled Water Pre-Treatment Wash

The distilled water pre-wash is used to remove previously applied chemicals (DFO / Ninhydrin) or dirt that may be on the item or surface. If the item has not been previously processed and/or the item is not contaminated this step may be omitted.

- Place the item to be processed and the test print in a thoroughly cleaned, scratch free, glass processing dish large enough to accommodate the item without folding.
- Add sufficient distilled water to ensure that the item is completely submerged.
- Gently rock the solution back and forth across the item during this process for 5-10 minutes. Optional: Use the Bench Rocker (Sirchie BR110) to rock the pan.
- Care must be exercised to avoid overlapping or unnecessary creasing of the item and non-metallic forceps or tongs without serrated edges should be used to handle and transfer item(s) from the dishes.

Step #2. Maleic Acid Pre-Treatment

The Maleic Acid pre-treatment is used to neutralize papers containing alkaline binders and fillers. This pre-treatment may be omitted for fragile papers such as tissue and porous surfaces such as wood.

- Placed the item to be processed and the test print in a thoroughly cleaned, scratch free, glass processing dish large enough to accommodate the item without folding.
- Add sufficient amount of Maleic Acid Solution to ensure that the item is completely submerged.

- Gently rock the solution back and forth across the item during this process for 5-10 minutes or until bubble evolution from the item ceases, whichever is the longer. Option: Use Bench Rocker.
- Care must be exercised to avoid overlapping or unnecessary creasing of the item and non-metallic forceps or tongs without serrated edges should be used to handle and transfer item(s) from the dishes.

Step #3. Physical Developer Working Solution

Sirchie's two-part (solution "A" and solution "B"), pre-mixed Physical Developer Solution should not be combined until immediately prior to use and then only in the amount needed to ensure the item in the dish is completely submerged.

Pour the selected amount of each solution in to a clean glass beaker stirring with a clean glass or plastic rod for one minute. The Physical Developer Working Solution has a 5 day shelf-life, provided it is stored at room temperature and in a dark container.

Solution "A"	Solution "B"
5 ml	90 ml
20 ml	360 ml
50 ml	900 ml

Processing:

- Place the item to be processed and the test print in a thoroughly cleaned, scratch free, glass processing dish large enough to accommodate the item without folding.
- Add sufficient amount of the mixed Physical Developer Solution to ensure that the item is completely submerged.
- Gently rock the solution back and forth across the item during this process for 10 minutes, periodically inspecting the item(s) to prevent overdevelopment of the impression. Option: Use Bench Rocker.
- Care must be exercised to avoid overlapping or unnecessary creasing of the item and non-metallic forceps or tongs without serrated edges should be used to handle and transfer item(s) from the dishes.
- Replace the mixed solution as necessary. Discard if the solution becomes badly contaminated with debris or if dark gray/silver particles are observed at the bottom of the dish or are floating on the surface of the Physical Developer Solution.

Development

- Grey colored impressions will appear which gradually darken with development.
- As more items are treated development time will increase. Spent solution must be discarded and the dish thoroughly cleaned and new mixed Physical Developer Solution added.
- Once optimal contrast is achieved the item should be removed and placed in the rinse water dish.

Step #4. Rinse Solution

The Rinse solution is used to prevent further development of the impressions and remove unnecessary solution from the item.

- Place the item to be processed and the test print in a thoroughly cleaned, scratch free, glass processing dish large enough to accommodate the item without folding.
- Add sufficient amount of distilled water (tap water may be used) to ensure that the item is completely submerged.
- Gently rock the solution back and forth across the item during this process for 3-5 minutes. Option: Bench Rocker may be used.
- Care must be exercised to avoid overlapping or unnecessary creasing of the item and non-metallic forceps or tongs without serrated edges should be used to handle and transfer item(s) from the dishes.
- Remove the item(s) from the rinse solution and allow the item to dry completely prior to proceeding. A hot air dryer may be used to expedite the drying process. However, a hot iron should not be used as it may destroy the impression.

Examination / Preservation

- The gray/silver impressions may be more visible after the drying process is completed.
- All visible impressions must be photographed immediately. Diffused illumination is usually satisfactory, but in some cases oblique lighting may be useful.
- Fluorescent examination may also prove useful, particularly if a confused background is present.
- After examination and photographing low contrasting impressions may be improved by re-treating the item starting with the Physical Developer Solution (step #3). It is not necessary to re-treat using the maleic acid solution.

References

U.S. Department of Justice, Federal Bureau of Investigation, Laboratory Division, Processing Guide for Developing Latent Prints. Revised 2000

Home Office, Scientific Research and Development Branch, Fingermark Visualisation Manual. Revised 2014.

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