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Name of Procedure:

DFO (1,8-Diazafluoren-9-one)

Suggested Uses:

DFO is a ninhydrin analogue that is used to develop latent impressions on porous items such as paper and cardboard. It produces highly fluorescent impressions when illuminated with the appropriate light source. Research has shown that DFO may be superior to ninhydrin in some cases for the development of latent impressions on porous items.

Equipment Needed to Perform Procedures:

A - Magnetic stirrer, magnetic follower and magnetic retriever

B - Glass beakers (various volumes)

C - Measuring cylinders (various volumes)

D - One (1) glass tray

E - Weighing boats (disposal) and weighing scales

F - Fume hood

I - Forceps (type which will not leave indented impressions)

J - Camera (35mm, 2 1/4, MP-4, CU5, TC III)

K - Rubber gloves and aprons

Chemicals Needed For Preparation of Chemical Solution(s):

A - One (1) gram of DFO

B - One-hundred eighty (180) ml of Methanol

C - Twenty (20) ml of Acetic Acid

D - One (1) liter of Acetone

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E - One (1) liter of Trichlorotrifluoroethane (Fluorisol)

F - Ten (10) ml of 2-Propanol (Isopropyl Alcohol)

G - Eight hundred thirty (830) ml of Petroleum Ether

H - Fifty (50) ml of Xylene

Formula/Directions for Preparation of Chemical Solution(s):

Note: There are three (3) formulations of DFO which may be utilized on porous items. The Acetone Formulation may be used on items which do not require analysis by another section; however, items which must be examined by the Documents Section or other laboratory sections should be processed with the Fluorisol or Ether/Xylene Formulation.

Acetone Formulation

1. Place forty (40) ml of Methanol into a small, clean glass beaker.
2. Add twenty (20) ml of Acetic Acid to the Methanol solution.
3. Add 0.5 gram of DFO to the solution. Stir with a magnetic stirrer until all of the DFO has completely dissolved.
4. Dilute to one liter (1000 ml) with Acetone.

Fluorisol Formulation

1. Place forty (40) ml of Methanol in a small, clean glass beaker.
2. Add twenty (20) ml of Acetic Acid to the Methanol solution.
3. Add 0.5 gram of DFO to the solution. Stir with a magnetic stirrer until all of the DFO has completely dissolved.
4. Dilute to one (1) liter with Trichlorotrifluoroethane (Fluorisol).

Petroleum Ether/Xylene Formulation

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Stock Solution:

1. Place one hundred eighty (180) ml of Methanol into a small, clean glass beaker.
2. Add twenty (20) ml of Acetic Acid to the Methanol solution.
3. Add one (1) gram of DFO to the solution. Stir with a magnetic stirrer until all of the DFO has completely dissolved.

Working Solution:

1. Place fifty (50) ml of Acetone in a clean fifteen hundred (1500) ml glass beaker.
2. Add the following chemicals, in order, to the Acetone solution while stirring with the magnetic stirrer:

Ten (10) ml of 2-Propanol (Isopropyl Alcohol)

Fifty (50) ml of Xylene

Sixty (60) ml of DFO Stock Solution

Eight hundred thirty (830) ml of Petroleum Ether

Processing Procedures for Application to Item(s) of Evidence:

1. Spray or dip item in freshly prepared solution for approximately thirty (30) seconds.
2. Allow the item to air dry for approximately thirty (30) seconds and spray or dip the item a second time and allow to completely air dry.
3. Latent impressions will develop at room temperature over a period of time; however, the chemical reaction can be accelerated by placing the item in an oven at 100 degrees Celsius for approximately ten (10) minutes. No humidity will be required.
4. The item should be examined utilizing the appropriate light source (See Laser/Alternate Light sources).

Steps to Preserve Developed Impressions:

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The most appropriate methods to preserve developed impressions is through photography, using the proper techniques (See Photographic Equipment/Procedures) and/or electronically recording the impressions (See Image Processing).

Safety Concerns:

The toxic and carcinogenic properties of DFO have not been thoroughly investigated and should be handled as with any chemical as potentially dangerous. Protective goggle, gloves and aprons should always be worn and the formulations always mixed in a fume hood. Goggles, gloves and aprons should be worn at all times during processing as the solution will also stain skin and clothing.

Storage and Location of Chemical and Solutions:

DFO may be stored in their original container until needed.

The stock and working solutions of DFO should be stored in non-breakable dark containers at all times to avoid direct exposure to sunlight.

Shelf Life:

DFO - Indefinite

Stock and Working solutions - Will last in excess of six (6) months.

Other Information:

DFO may be used in conjunction with Ninhydrin or other analogs; however, it is recommended that DFO be used as the first step in processing.

DFO reacts with the amino acids present in perspiration.

Various wavelengths from a laser and/or alternate light sources should utilized when attempting to locate latent impressions.