

## **Technical Procedure for DFO (1, 8-Diazafluoren-9-one)**

**1.0 Purpose** – This procedure is used to develop latent prints on porous surfaces.

**2.0 Scope** – This procedure applies to items of evidence with porous surfaces. DFO reacts with amino acids present in fingerprint residue.

**3.0 Definitions** – N/A

### **4.0 Equipment, Materials and Reagents**

#### **4.1 Equipment and Materials**

- Laboratory coat and gloves
- Magnetic stirrer, magnetic follower and magnetic retriever
- Glass beakers
- Graduated cylinders
- Glass trays
- Dark, shatter-proof container
- Weigh boats
- Fume hood
- Forceps (which will not leave indented impressions)
- Camera
- Mini-CrimeScope and/or alternate light source

#### **4.2 Reagents**

- DFO (1,8-Diazafluoren-9-one) (1 g)
- Methanol (180 mL)
- Acetic Acid (20 mL)
- Acetone (1 L)
- Trichlorotrifluoroethane (fluorisol) (1 L)
- 2-Propanol (isopropyl alcohol) (10 mL)
- Petroleum Ether (830 mL)
- Xylene (50 mL)

**5.0 Procedure** – There are three (3) formulations of DFO which may be used 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 other Laboratory Sections shall be processed with either the fluorisol or ether/xylene formulation.

#### **5.1 Acetone Formulation**

**5.1.1** Place forty (40) mL of methanol and a magnetic stirrer into a clean glass beaker.

**5.1.2** Add twenty (20) mL of acetic acid while stirring.

5.1.3 Add 0.5 g of DFO to the solution and continue stirring until completely dissolved.

5.1.4 Dilute to one (1) L with acetone.

## 5.2 Fluorisol Formulation

5.2.1 Place forty (40) mL of methanol and a magnetic stirrer into a clean glass beaker.

5.2.2 Add twenty (20) mL of acetic acid while stirring.

5.2.3 Add 0.5 g of DFO to the solution and continue stirring until completely dissolved.

5.2.4 Dilute to one (1) L with fluorisol.

## 5.3 Petroleum Ether/Xylene Formulation

### 5.3.1 Stock Solution

5.3.1.1 Place one hundred eighty (180) mL of methanol and a magnetic stirrer into a clean glass beaker.

5.3.1.2 Add twenty (20) mL of acetic acid while stirring.

5.3.1.3 Add one (1) g of DFO to the solution and continue stirring until completely dissolved.

### 5.3.2 Working Solution

5.3.2.1 Place fifty (50) mL of acetone and a magnetic stirrer into a clean glass beaker.

5.3.2.2 Add the following chemicals in the order listed while stirring.

- Ten (10) mL of 2-propanol
- Fifty (50) mL of xylene
- Sixty (60) mL of DFO Stock Solution
- Eight hundred and thirty (830) mL of petroleum ether

## 5.4 Processing Procedures:

5.4.1 Forensic Scientists shall produce a self-made test print to be processed concurrently with items of evidence. (See Technical Procedure for Ensuring Quality Control.)

5.4.2 Spray or dip item in DFO solution for approximately thirty (30) seconds.

5.4.3 Allow the item to dry for approximately thirty (30) seconds, then spray or dip the item a second time and allow drying.

5.4.4 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 one hundred (100) °C for approximately ten (10) minutes. No humidity is required.

- 5.4.5 The item must be examined and photographed using the appropriate light source (see laser/alternate light source)

**5.5 Standards and Controls – N/A**

**5.6 Calibration – N/A**

**5.7 Sampling – N/A**

**5.8 Calculations – N/A**

**5.9 Uncertainty of Measurement - N/A**

**6.0 Limitations**

- 6.1 DFO may be used in conjunction with ninhydrin or other analogs; however, when used, DFO shall be used as the first step in porous chemical processing.

- 6.2 DFO is a ninhydrin analog that may be used to develop latent prints on porous items of evidence. It shall be stored in its original container until used.

- 6.3 The stock and working solutions of DFO shall be stored in dark shatter-proof containers.

- 6.4 The shelf life of DFO reagent is indefinite.

- 6.5 The shelf life of stock and working solutions of DFO is six (6) months.

- 7.0 Safety** - The toxic and carcinogenic properties of DFO have not been thoroughly investigated and shall be treated as potentially dangerous. Protective goggles, gloves, and lab coats shall be worn and the formulations shall be mixed in a fume hood. Goggles, gloves and lab coats shall be worn during processing as the solution will also stain skin and clothing.

**8.0 References**

Kent, T., ed. *Manual of Fingerprint Development Techniques: A Guide to the Selection and Use of Processing for the Development of Latent Fingerprints*. Police Scientific Development Branch, London (July 1992).

Lee, H.C. "Methods of Latent Print Development." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 1987): 15 – 24.

Lennard, C.J. and P.A. Margot. "Sequencing of Reagents for the Improved Visualization of Latent Fingerprints." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 1987): 141-142.

*Manual of Fingerprint Development Techniques: A Guide to the Selection and Use of Processes for the Development of Latent Fingerprints*. Scientific Research and Development Branch, London. (1986): 2-8.

Masters, N., R. Morgan and E. Shipp. "DFO, Its Usage and Results." *Journal of Forensic Identification*. Vol. 41, 1: 3-10 (February 1991).

Pounds, C.A., et al. "The Use of 1, 8-Diazafluoren-9-one (DFO) for the Fluorescent Detection of Latent Fingerprints on Paper. A Preliminary Evaluation." *Journal of Forensic Sciences*. Vol. 35, 1: 169 – 175 (1990).

Soilovic, M. "Improved Method for DFO Development of Latent Fingerprints." *Forensic Science International*. Vol. 60: 141 – 153 (1993).

Trozzi, T.A., R.L. Schwartz and M.L. Hollars. *Processing Guide for Developing Latent Prints*. (2000): 1-64.

US Department of Justice. *Chemical Formulas and Processing Guide for Developing Latent Prints*. FBI Laboratory Division, Latent Fingerprint Section (1994).

## 9.0 Records – N/A

## 10.0 Attachments – N/A

| Revision History |                |                   |
|------------------|----------------|-------------------|
| Effective Date   | Version Number | Reason            |
| 09/17/2012       | 1              | Original Document |
|                  |                |                   |
|                  |                |                   |
|                  |                |                   |
|                  |                |                   |
|                  |                |                   |