

## Technical Procedure for Coumarin

**1.0 Purpose** – This procedure is a non-porous development procedure.

**2.0 Scope** – This procedure is a step for processing non-porous evidence that may contain impressions that require developing/enhancing.

**2.1** One of the most effective ways to recover latent prints from items of evidence is to use a fluorescent dye followed by a laser or alternate light source examination. Coumarin is one of the most effective laser dyes for recovering latent prints on various non-porous surfaces. This dye is normally used on non-porous surfaces; however, the dye may be used on porous or semi-porous surfaces under certain conditions. Examples include glossy magazine covers/pages, some Styrofoam, etc. Coumarin is extremely efficient in that it is highly fluorescent and can be used with various alternate light sources.

### 3.0 Definitions

- **Alternate light source:** Any of the multiple forensic light sources readily available in the Digital/Latent Evidence Section, including, but not limited to, the CrimeScope, Mini-CrimeScope, TracER Laser, and Ultra-Lite ALS.
- **CE:** Cyanoacrylate Ester also known as super glue.

### 4.0 Equipment, Materials and Reagents

#### 4.1 Equipment and Materials

- Orange filter (goggles and/or camera lens filter)
- Alternate light source
- Fume hood
- Gloves
- Face shield and/or safety goggles
- Plastic applicator bottles or tray for submersion

#### 4.2 Reagents

- Coumarin (powder)
- Methanol

### 5.0 Procedure

#### 5.1 Mixing Procedure

**5.1.1** Place 0.005 gram of coumarin (powder) in five hundred (500) mL of methanol. (To approximate this amount, dampen the tip of an unfolded paperclip in methanol and insert it into the chemical bottle. The powder that adheres to the paperclip can then be transferred into the methanol.)

**5.1.2** Thoroughly dissolve the coumarin powder in the methanol. Solution is ready for use.

#### 5.2 Application Procedure

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

**5.2.2** First apply cyanoacrylate ester to the item of evidence. Coumarin adheres to the chlorosis that occurs after processing with CE.

**5.2.3 Non-porous items:** Utilizing the fume hood and gloves, spray or completely submerge the item of evidence in the methanol/coumarin solution. Allow to dry.

**5.2.4** When completely dry, view the item using the CrimeScope, Mini-CrimeScope or TracER Laser. Use goggles to view any fluorescence on the item. Latent prints will fluoresce bright yellow.

**Note:** Coumarin will preferentially adhere to cyanoacrylate ester prints, but a certain amount may adhere to the item surface. If too much dye is used, the entire surface will fluoresce and mask the latent print. In this case, rinsing the item with plain methanol will cause the excess dye to wash away and, in most cases, the dye adhering to the latent print will remain.

**5.2.5 Porous/semi-porous items:** Follow the above directions for coumarin preparation in 5.1, substituting distilled water for the methanol.

**Note:** Porous/semi-porous items shall be processed with cyanoacrylate ester prior to treatment; however, these items pose a problem when using coumarin as a solution stain. The dye penetrates the pores of the item causing overall fluorescence. The latent prints will be masked in this instance and rinsing the excess dye is difficult. The best way to solution stain porous/semi-porous items is to use the water based coumarin solution.

**5.2.6** Once the item has been sprayed or submerged, it should be rinsed IMMEDIATELY with clear water and scanned with an ALS or Laser.

**5.2.7** Any latent prints shall be preserved using photography. Camera shall be equipped with an orange filter for print visualization. The image processing system shall be utilized to preserve identifiable latent impressions and to create 1:1 prints for comparison purposes (see Section Image Processing Technical Procedure). **Note:** All images (e.g., photographs, latent lifts, and impressions) shall be retained in the case record object repository.

**5.3 Standards and Controls – N/A**

**5.4 Calibration – N/A**

**5.5 Sampling – N/A**

**5.6 Calculations – N/A**

**5.7 Uncertainty of Measurement – N/A**

**6.0 Limitations –** Coumarin is generally designed to be used for the processing of non-porous evidence. Some porous/semi-porous items may be processed using this technique.

**6.1** The cyanoacrylate ester fuming process is vital to the success of coumarin processing.

**6.2** Coumarin powder has an indefinite shelf life; however, once prepared it has a shelf life of six (6) months.

**6.3** All prepared solution shall be stored in dark, shatter-proof bottles. Working solution may be stored in clear spray bottles.

**6.4** Coumarin powder shall be stored in its original shipping container.

**6.5** Coumarin may be used in conjunction with other fluorescent dyes.

**7.0 Safety** –The safety concerns regarding coumarin have not been thoroughly investigated and there are varied opinions on the associated health effects of this chemical. The chemical solution shall be used with extreme care until the full effects are known. As with any chemical, it may cause irritation when in contact with the eyes or skin and may be harmful if inhaled or ingested. Protective gloves, eye goggles and aprons shall be worn when using coumarin. The methanol used in this solution is toxic and flammable and must be handled with extreme care.

## **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*. (January 1986): 2-8.

*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).

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 |
|                  |                |                   |
|                  |                |                   |
|                  |                |                   |
|                  |                |                   |
|                  |                |                   |
|                  |                |                   |