

# Latent Fingerprint Processing Techniques - Selection & Sequencing Guide



**Chesapeake Bay Division**

**International Association for Identification**



## About This Program

Special thanks to Alexander Mankevich, Forensic Scientist Advanced for Maryland Department of State Police, the original creator of the Interactive Chemical Reagent Program.

### About this Program:

Latent Fingerprint Processing Techniques - Selection & Sequencing Guide. The focus of this program is to provide background and guidance regarding a latent fingerprint processing technique's capabilities, applicability, incompatibilities and sequencing in order to guide an examiner in his/her selection of an appropriate technique.

This program is the collaborative efforts of members of the Chesapeake Bay Division - International Association for Identification (CBD-IAI). The information about latent fingerprint processing techniques benefits from the collective wisdom and experience of CBD-IAI member examiners from federal, state and county forensic laboratories.

Although some information is provided, this program does not comprehensively cover other important aspects to the selection of latent fingerprint processing techniques such as safety, quality control, etc. For more detailed information regarding safety, alternative chemical formulations, quality control - quality assurance, chemical disposal and storage issues you are advised to consult the reagent's Material Safety Data Sheet (MSDS), and/or the literary references provided at the bottom of each reagent's page.

The Chesapeake Bay Division of the International Association for Identification (CBD-IAI) makes this program available to all latent print examiners by clicking "BACK TO START".

This program is one example of the CBD-IAI providing professional guidance and instructional services to the Identification Community.

Any corrections, concerns or suggestions regarding this program may be addressed to:

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## Disclaimer

Persons choosing to prepare, apply and store any of the latent fingerprint processing techniques and reagents outlined in this program do so at their own risk. You are advised that some chemicals are classified as hazards, harmful, toxic, irritants, flammable, etc, and that improper or inattentive use or misuse of any of these reagents may result in (but not limited to) skin, eye, respiratory or mucus membrane damage/injury, or the staining of skin, clothing or physical objects. Persons are urged to avail themselves to the instructions and precautionary notes found in the Material Safety Data Sheets (MSDS) and/or the literary references provided at the bottom of each reagent's page before engaging in the use of the latent fingerprint processing technique. Observe all federal, state and local environmental disposal regulations. State and local disposal regulations may differ from federal disposal regulations.

The Chesapeake Bay Division - International Association for Identification (CBD-IAI), its Officers, Board of Directors, Members, or any of the agencies and their members contributing their knowledge and experience to this program, assume no liability or responsibility for damage or injuries (personal or property) that may result from persons engaging in any of the latent fingerprint processing techniques outlined in this program.



# Latent Fingerprint Processing Techniques

## 1. AMINO ACID TECHNIQUES

- Cyanoacrylate Ester
- D.F.O.
- 1,2 Indanedione
- 5-MTN
- Ninhydrin

## 2. ADHESIVE TAPE SURFACES

- Gentian Violet
- Liqui-Drox
- Liqui-Nox
- Sticky Side Powder

## 3. BLOOD TECHNIQUES

- Amido Black - Methanol
- Coomassie Blue
- Crowle's Double Stain
- D.A.B.
- Leucocrystal Violet

## 4. CARTRIDGE CASES

- Basic Yellow 40
- Cyanoacrylate Ester
- Gun Bluing

## 5. ECCRINE TECHNIQUES

- Cyanoacrylate Ester
- D.F.O.
- 1,2 Indanedione
- 5-MTN
- Ninhydrin
- Silver Nitrate

## 6. FLUORESCENT TECHNIQUES

- Ardrox
- Basic Yellow 40
- D.F.O.
- 1,2 Indanedione
- Liqui-Drox
- M.B.D.
- M.R.M. 10
- Nile Red
- R.A.M.
- R.A.Y.
- Rhodamine6G
- Safranin O
- Thenoyl Europium Chelate

## 7. GLASS SURFACES

- Basic Yellow 40
- Cyanoacrylate Ester
- M.B.D. Dye
- Small Particle Reagent

## 8. GLOSSY PAPER SURFACES

- Cyanoacrylate Ester
- Small Particle Reagent
- M.B.D. Dye
- Basic Yellow 40

## 9. METAL SURFACES

- Cyanoacrylate Ester
- Small Particle Reagent
- M.B.D. Dye
- Basic Yellow 40



#### **10. NON-DESTRUCTIVE**

- Iodine Fuming
- Fluorescent Light
- Electrostatic Lifting
- Ultra-Violet Light
- Visual Examination

#### **11. NON-POROUS SURFACES**

- Cyanoacrylate Ester
- Gentian Violet
- Small Particle Reagent

#### **12. PLASTIC SURFACES**

- Basic Yellow 40
- Cyanoacrylate Ester
- M.B.D. Dye
- Small Particle Reagent

#### **13. POROUS SURFACES**

- D.F.O.
- Iodine Fuming
- 1,2 Indanedione
- 5-MTN
- Ninhydrin
- Physical Developer
- Zinc Chloride

#### **14. POST-CYANOACRYLATE**

- Ardox
- Basic Red 28
- Basic Yellow 40
- D.F.O.
- Liqui-Drox
- M.B.D. Dye
- M.R.M. 10
- Nile Red
- R.A.M.
- R.A.Y.

- Rhodamine 6G
- Sudan Black
- Thenoyl Europium Chelate

#### **15. POST-NINHYDRIN**

- Nickle Nitrate
- Physical Developer
- Silver Nitrate
- Small Particle Reagent
- Zinc Chloride

#### **16. RAW WOOD SURFACES**

- D.F.O.
- Iodine Fuming
- 1,2 Indanedione
- Ninhydrin
- 5-MTN
- Physical Developer
- Silver Nitrate

#### **17. SEBACEOUS TECHNIQUES**

- Gentian Violet
- Iodine Fuming
- Physical Developer
- Small Particle Reagent

#### **18. ULTRA-VIOLET INDUCED**

- Ardox
- Basic Yellow 40
- Liqui-Drox
- Silver Nitrate
- Thenoyl Europium Chelate
- Ultra-Violet Light

#### **19. WET SURFACES**







- Physical Developer
- Small Particle Reagent
- Sudan Black



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## Quick Hazard Guide

Flammable	Harmful/Irritant	Eye Damage	Shock	Toxic	Corrosive
	 HARMFUL/IRRITANT	 NOTICE EYE DAMAGE MAY OCCUR DO NOT VIEW PROCESS WITHOUT SHADES IN PLACE	 DANGER ELECTRIC SHOCK HAZARD	 VERY TOXIC	 CORROSIVE 8



## AMIDO BLACK – METHANOL BASES

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Deep Blue</b>		 HARMFUL/IRRITANT		
FORMULA				
Developer Solution:	Rinse Solution:		Final Rinse:	
1. 2 g Amido black dye 2. 100 ml Glacial acetic acid 3. 900 ml Methanol (Combine and mix with a stirring device for 30 minutes.)	1. 100 ml Glacial acetic acid 2. 900 ml Methanol		1. 1-liter distilled water	
PROCEDURE OF APPLICATION				
1. Be certain that the blood is 'dried' prior to application.  2a. Squeegee bottle application - Apply for 30 to 90 seconds. A squeegee bottle is used to apply rinse.	-- or --	2b. Tray immersion - Immerse into dye solution 30 to 90 seconds. Immerse into a tray of rinse solution for 1 minute. 3. Apply the final water rinse. 4. Allow the item to air dry.		
DEVELOPMENT COMPLETE WHEN				
Maximum contrast is achieved of the blue development color upon repeated staining and rinsing procedures.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Cyanoacrylate fuming may be detrimental to this reagent.  Excessively blood-stained items will obliterate detail.	Painted surfaces may be deteriorated by the methanol in the working and rinse solutions.  Excessively blood-stained items and porous surfaces that strongly absorb the dye will yield little contrast to the developed detail.	This process is detrimental to some biological examinations.  Don't let the evidence overdevelop in the working solution.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark or Clear stoppered glass or plastic bottles.	Fume hood use is required to prepare and apply the working solution.	Be certain that the blood is "dried" to the surface prior to applying this reagent.
SIMILAR REAGENT		
<ul style="list-style-type: none"> <li>• Amido Black - Water Base</li> <li>• Crowle's Double Stain</li> <li>• D.A.B.</li> <li>• Leucocrystal Violet</li> </ul>		

<p><b>CHEMICAL NAME:</b> Amido Black - Methanol Base</p> <p><b>SURFACE USED ON:</b> Blood-Stained Porous &amp; Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Proteins in Blood</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Ultra-Violet Light</li> <li>4. <b>Amido Black-Methanol Base</b></li> <li>5. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Blood Enhancement</p> <p><b>OTHER CHEMICAL NAME(S):</b> Naphthol Blue Black Naphthalene 12B Acid Black 1, 10A, 10B Eriodin Blue Black B Acid Black 10B</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>
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### Process Summary:

A dye staining process, followed by rinse procedures, that is used to enhance detail in faint bloody impressions. Bloody impressions should be "dried" prior to staining with this reagent.

### Accepted Deviations:

Development time may be shortened if the evidence surface strongly absorbs the dye.

### Supporting Reference Materials:

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.













3. Lee, H.C. & Gaensslen, R.E. (1991), "Advances in Fingerprint Technology", Elsevier, pg.86.
4. Slater, J., "Techniques for the Enhancement of 2-Dimensional Footwear Impressions in Blood", Forensic Services Div., May, 1995.
5. Navarro, R.L., "Chemical Enhancement of Questioned Footwear Impressions", North Carolina State Bureau of Inv., 1992.



## ARDROX

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence	  Yellow Filter	  NOTICE EYE DAMAGE MAY OCCUR DO NOT VIEW PROCESSES WITHOUT SHIELDS IN PLACE	  UV Eye Protection	 Yes No
FORMULA				
Working Solution (Combine in the order given):				
1. 2 ml Ardrex P-133D 2. 10 ml Acetone 3. 25 ml Methanol 4. 10 ml Isopropanol 5. 8 ml Acetonitrile 6. 945 ml Petroleum ether				
PROCEDURE OF APPLICATION				
1. a) Tray immersion or squirt bottle. - 5 seconds. -or- b) Water rinse - Squirt bottle application or gently running stream. – 10 seconds  2. a) View under an Ultra-violet lamp in the 280 nm to 365 nm range. Use ultra-violet protection goggles. -or- b) View under a Forensic Light Source in the 435 nm to 480 nm range. Use yellow colored goggles.  3. Photograph results using a 2-A haze, yellow colored or 515(BP 35) bandpass filter.				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Do not mix the working solution using a magnetic stirrer. Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the 500 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Clear or dark stoppered glass or plastic bottles.	Use Ultra-violet protection goggles when working with long-wavelength ultra violet light sources.  Prepare the working solution in a Fume hood.	The recommended procedure of application is to soak the item in a tray of the dye.  A rinse using Petroleum ether may be necessary to avoid excessive staining by the dye.
SIMILAR REAGENTS		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• M.B.D.</li> <li>• Nile Red</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> <li>• Thenoyl Europium Chelate</li> </ul>		<u>Not Necessarily in this Order:</u> <ul style="list-style-type: none"> <li>• M.R.M. 10</li> <li>• R.A.M.</li> <li>• R.A.Y.</li> </ul>
<p><b>CHEMICAL NAME:</b> Ardrox</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit, UV Induced</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. <b>Ardrox</b></li> <li>5. Ultra-Violet Light</li> <li>6. R.A.Y.</li> <li>7. Forensic Light</li> </ol>		<p><b>RIDGE DETAIL VISUALIZED BY:</b> Ultra-Violet light induced Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Post Cyanoacrylate Non-Porous surfaces Fluorescent technique</p> <p><b>OTHER CHEMICAL NAME(S):</b> Ardrox P-133D Tracer tech P-133D</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>

**Process Summary:**

A fluorescent dye-stain used to make cyanoacrylate-developed latent prints more visible. A fluorescent light source or ultra-violet lamp that will output light in the 280 nm to 480 nm region is required for this process.

**Accepted Deviations:**







The working solution may be applied by either dipping or with a squeegee bottle. Some researchers advise to allow the cyanoacrylate-developed prints to "sit" overnight prior to applying the dye stain.

**Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.



## BASIC YELLOW 40

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence	  Yellow Filter	 FLAMMABLE 3	 UV Eye Protection	 Yes No
FORMULA				
Working Solution:				
Take 1 gram Basic Yellow 40 dye dissolved in 500 ml Methanol.				
PROCEDURE OF APPLICATION				
1. a) Tray immersion or aerosol sprayer for 5 seconds. b) Water Rinse - Squirt bottle application or gently running stream for 10 seconds  2. a) View under an Ultra-Violet lamp around 365 nm. View using ultra-violet protection goggles. b) View under a Forensic Light Source in the 450 nm to 485 nm range. View using yellow colored goggles.  3. Photograph results using a yellow colored or 515(BP 35) bandpass filter.				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Too much absorbed dye stain fluoresces too brilliantly to be effective for photography.	Items that inherently fluoresce in the 490 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark stoppered glass bottles.	Use Ultra-violet protection goggles when working with low wavelength (i.e. 365 nm) light sources.  Fume hood use is required.	Misting the item with Basic Yellow 40 from an aerosol sprayer cuts down on excessive background staining.		



SIMILAR REAGENT	SEQUENTIAL REAGENT
<ul style="list-style-type: none"><li>• Ardrox</li><li>• Basic Red 28</li><li>• Liqui-Drox</li><li>• M.B.D.</li><li>• Nile Red</li><li>• Rhodamine 6G</li><li>• Safranin O</li><li>• Thenoyl Europium Chelate</li></ul>	<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"><li>• M.R.M. 10</li><li>• R.A.M.</li><li>• R.A.Y.</li></ul>

<p><b>CHEMICAL NAME:</b> Basic Yellow 40</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"><li>1. Visual Examination</li><li>2. Forensic Light</li><li>1. Cyanoacrylate Fuming</li><li>2. <b>Basic Yellow 40</b></li><li>3. R.A.Y.</li><li>4. Forensic Light</li></ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Ultra-Violet light induced Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Post Cyanoacrylate Non-Porous surfaces Fluorescent technique</p> <p><b>OTHER CHEMICAL NAME(S):</b> BY40 Panacryl Brilliant Flavine 10GFF Maxilon Flavine 10GFF Yellow Brilliance</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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### Process Summary:

A fluorescent dye-stain used to enhance cyanoacrylate-developed latent prints. A forensic light source or ultra-violet lamp that will output light between 365 nm and 500 nm is required for this process.

### Accepted Deviations:

The working solution may be applied by either dipping, spraying or squeegee bottle. Some researchers advise to allow the cyanoacrylate-developed prints to "sit" overnight prior to applying the dye stain.

### Supporting Reference Materials:






1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.



2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## COOMASSIE BLUE

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Deep Blue				
FORMULA				
Dye Solution		Rinse Solution		
<ul style="list-style-type: none"> <li>• 4 g of Coomassie Blue</li> <li>• 200 ml of Methanol</li> <li>• 200 ml of Distilled Water</li> <li>• 40 ml of Glacial Acetic Acid</li> </ul>		<ul style="list-style-type: none"> <li>• 450 ml of Methanol</li> <li>• 450 ml Distilled Water</li> <li>• 100 ml of Glacial Acetic Acid</li> </ul>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Be certain that the blood is 'fixed' to the surface.</li> <li>2. Squeegee bottle application - for 30 to 90 seconds. A squeegee bottle is used to apply rinse.</li> <li>3. Tray immersion into dye solution 30 to 90 seconds.</li> <li>4. Tray immersion into rinse solution for 1 minute.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
Maximum contrast is achieved of the blue development color upon repeated staining and rinsing procedures.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Dye will strongly absorb palmar sweat. Excessively blood-stained items will obliterate detail.	Porous surfaces that strongly absorb the dye. Excessively blood-stained items. Yields poor results on concrete surfaces.	Don't let the evidence overdevelop in the working solution.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark or Clear stoppered glass or plastic bottles.	Fume hood use is required to prepare and apply the working solution.	Be certain that the blood is 'fixed' to the surface.		
SIMILAR REAGENT		SEQUENTIAL REAGENTS		
<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> <li>• Crowle's Double Stain</li> <li>• D.A.B.</li> <li>• Leucocrystal Violet</li> </ul>		<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> </ul>		





<p><b>CHEMICAL NAME:</b> Coomassie Blue</p> <p><b>SURFACE USED ON:</b> Blood-Stained Porous &amp; Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Proteins in Blood</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"><li>1. Visual Examination</li><li>2. Forensic Light</li><li>3. Ultra-Violet Light</li><li>4. <b>Coomassie Blue</b></li><li>5. Forensic Light</li></ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces Blood Enhancement</p> <p><b>OTHER CHEMICAL NAME(S):</b> Coomassie Brilliant Blue Coomassie Brilliant Blue R</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>
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### Process Summary:

A dye staining process, followed by a rinse procedure used to enhance detail in faint bloody impressions. "Fixing" of bloody impressions is not strictly required prior to staining. The contrast achieved with this reagent is not as strong as Amido Black due to the lighter color of the dye stain, and the development of the surfaces' background.

### Accepted Deviations:

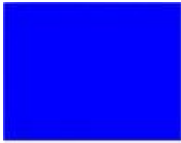




Development time may be shortened if the evidence surface strongly absorbs the dye.

### Supporting Reference Materials:

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Lee, H.C. & Gaensslen, R.E. (1991), "Advances in Fingerprint Technology", Elsevier, pg.86.
4. Slater, J., "Techniques for the Enhancement of 2-Dimensional Footwear Impressions in Blood", Forensic Services Div., May, 1995. Navarro, R.L., "Chemical Enhancement of Questioned Footwear Impressions", North Carolina State Bureau of Inv., 1992.



## CROWLE'S DOUBLE STAIN

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Blue</b>		 HARMFUL/IRRITANT		
FORMULA				
Developer Solution (Mix until dissolved):		Rinse Solution		
<ul style="list-style-type: none"> <li>• 2.5 g of Crocein scarlet 7B</li> <li>• 150 mg of Coomassie brilliant blue R</li> <li>• 50 ml of Glacial acetic acid</li> <li>• 30 ml of Trichloroacetic acid</li> </ul> <p>Dilute above mixture into 1 Liter of distilled water. Use a stirring device until all the dye is dissolved.</p>		<ul style="list-style-type: none"> <li>• 30 ml of Glacial acetic acid</li> <li>• 970 ml of distilled water</li> </ul>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Spray, immerse, or use a squirt bottle to apply the Developer solution to the item.</li> <li>2. Wait 30 to 90 seconds.</li> <li>3. Apply the Rinse solution.</li> <li>4. Repeat these steps if necessary to obtain maximum contrast.</li> <li>5. Photograph the final result.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
Maximum contrast is obtained of the blood impression against the background.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Excessively blood-stained items will obliterate detail.	Porous surfaces that strongly absorb the dye.  Excessively blood-stained items.	Don't let the evidence overdevelop in the Developer solution.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark or Clear stoppered glass or plastic bottles.	Fume hood use is required for preparing and applying reagent.	The blood impression must be completely dry before processing with this reagent.		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> <li>• Crowle's Double Stain</li> <li>• D.A.B.</li> <li>• Leucocrystal Violet</li> </ul>	<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> </ul>

<p><b>CHEMICAL NAME:</b> Crowle's Double Stain</p>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p>
<p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Latent Print Residue and Blood Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Ultra-Violet Light</li> <li>4. <b>Crowle's Double Stain</b></li> <li>5. Forensic Light</li> <li>6. Amido Black</li> </ol>	<p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces Blood Enhancement</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>

### Process Summary:

A stain reagent used to enhance bloody impressions that are visible, and to develop latent prints. The technique consists of a developer solution and a rinse solution. Water is used as a final rinse.

### Accepted Deviations:






Tap water may be substituted for distilled water in the Rinse solution if necessary.

### Supporting Reference Materials:

1. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.



## CYANOACRYLATE ESTER

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
		 HARMFUL/IRRITANT		
<b>FORMULA</b>				
Two Options:				
A. Liquid glue: Deposit an amount of glue about 20 mm in diameter in a small porcelain plate.		-- or --	B. Commercial "Gel-pac": Open pack to release fumes.	
<b>PROCEDURE OF APPLICATION</b>				
<ol style="list-style-type: none"> <li>1. Place item(s) into enclosed chamber.</li> <li>2. Add glue (either option A. or B. in the formula).</li> <li>3. Add humidity source (cup of warm water).</li> <li>4. Fume at least 10 minutes, monitor often for development.</li> <li>5. Evaluate development under an oblique light source.</li> <li>6. Photograph the developed detail.</li> <li>7. Process with dye-stain.</li> </ol>				
<b>DEVELOPMENT COMPLETE WHEN</b>				
<p>The white crust is polymerized on the impression.</p> <p>Check the progress of polymerization after 5 to 10 minutes.</p>				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Humidity around 80% relative humidity must be introduced in order to catalyze the nonspecific polymerization reaction. Gel-Pac may be exhausted of the active ingredients.	<p>Moisture-laden surfaces. Items to be submitted for Firearms and Biology examination.</p> <p>Light-colored surfaces which present little contrast for the developed detail.</p>	<p>Don't breathe the fumes after opening the processing tank. Let the fumes escape from the tank before removing the items.</p> <p>Store &amp; examine the treated item in a well-ventilated area.</p>		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Gel-pacs can be stored in zippered plastic bags.	Ventilation in the area of fuming tanks is required.  Cyanoacrylate is an irritant if inhaled.	View using oblique white light to visualize any faintly developed prints. Use a post-cyanoacrylate dye stain to improve the visualization of any developed detail.  Researchers recommend to let the developed detail 'sit' overnight before treating with dye stains.
SEQUENTIAL REAGENTS		
<p style="text-align: center;"><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• M.B.D<sub>2</sub></li> <li>• M.R.M. 10</li> <li>• R.A.M.</li> <li>• R.A.Y.</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> <li>• Thenoyl Europium Chelate</li> </ul>		
<p><b>CHEMICAL NAME:</b> Cyanoacrylate Ester</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Eccrine Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. <b>Cyanoacrylate Fuming</b></li> <li>4. Dye Stain</li> <li>5. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces</p> <p><b>OTHER CHEMICAL NAME(S):</b> Superglue Ethyl-2-Cyanoacrylate Methyl-2-Cyanoacrylate</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>	



### **Process Summary:**

An item for processing is placed within an enclosed chamber. Fumes from the active ingredient of Cyanoacrylate ester polymerizes on the components of the impression's residue creating a white impression. Several post-cyanoacrylate dye stains or powders may be applied to improve the visualization of the developed detail.

### **Accepted Deviations:**






Many forms of superglue fuming, fuming acceleration and chamber construction may be used for evidence processing. Items may also be processed with Cyanoacrylate ester using vacuum chambers.

### **Supporting Reference Materials:**

1. Lee, H.C. and Gaensslen, R.E. (1984), "Cyanoacrylate Fuming: Theory and Procedures".
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
5. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## D.A.B.

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Brown		 HARMFUL/IRRITANT		
<b>FORMULA</b>				
1. (Solution A): Take 20g of 5-Sulfosalicylic Acid dissolved in 1L distilled water 2. (Solution B): Take 100ml of 1N phosphate buffer (Ph 7.4) and mix it in 800ml distilled water 3. (Solution C): Take 1g of DAB dissolved in 100ml distilled water  4. (Working Solution): Take 180ml of Solution B and 20ml of Solution C and then add 1ml 30% Hydrogen peroxide				
<b>PROCEDURE OF APPLICATION</b>				
1. Solution A fixation 2-3 minutes, then water rinse.	-- or --	2b. Paper towel saturation of working solution for 3 minutes.		
2a. Tray immersion of item into working solution for 3 to 4 minutes.		3. Distilled water rinse.		
<b>DEVELOPMENT COMPLETE WHEN</b>				
Enhancement of blood detail is noted.				
<b>SOURCE OF ERROR</b>	<b>INCOMPATIBILITIES</b>	<b>PRECAUTIONS</b>		
D.A.B. is a protein stain that is not specific for blood. Dye will also absorb to palmar sweat.	Porous items that strongly absorb the dye. Excessively blood-stained items.	D.A.B. processing must be completed before processing with Amido Black.		
Cyanoacrylate fuming has an adverse effect on D.A.B.	Cyanoacrylate fuming is detrimental to this process.	Use Distilled water only.		
Distilled water must be used.				
<b>STORAGE CONTAINER</b>	<b>SAFETY</b>	<b>RECOMMENDATIONS</b>		
Dark stoppered plastic bottles.	D.A.B. spots are difficult to remove from skin or clothing	Enhanced results that are exposed to direct sunlight should be photographed immediately, since photo ionization may produce unwanted background development.		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> <li>• Coomassie Blue</li> <li>• Crowle's Double Stain</li> <li>• Leucocrystal Violet</li> </ul>	<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> <li>• Coomassie Blue</li> <li>• Crowle's Stain</li> <li>• Leucocrystal Violet</li> </ul>

<p><b>CHEMICAL NAME:</b> Diaminobenzidine</p> <p><b>SURFACE USED ON:</b> Blood-Stained Porous &amp; Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Proteins in Blood</p>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces Blood Enhancement</p> <p><b>OTHER CHEMICAL NAME(S):</b></p>
<p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Ultra-Violet Light</li> <li>4. <b>D.A.B.</b></li> <li>5. Forensic Light</li> <li>6. Amido Black</li> </ol>	<p>3,3'-Diaminobenzidine Tetrahydrochloride</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> 48 hours if refrigerated</p>

### Process Summary:

A peroxidase reagent which is colorless, but becomes strongly visible when reacted with blood. May be used in conjunction with Amido Black. Good results achieved on some paper items. Ninhydrin has no effect on the D.A.B. process. Other blood enhancement colored protein stains may be used after D.A.B. Cyanoacrylate fuming is detrimental to D.A.B. processing.

### Accepted Deviations:

D.A.B. can be applied in two general manners - by immersing the item in a D.A.B. solution, or, by a "tissue" method.

### Supporting Reference Materials:

1. Sahs, P., "DAB: An Advancement in Blood Print Detection", J. Forensic. Ident., Vol. 42., No. 5, (1992), pg 412.











2. Slater, J., "Techniques for the Enhancement of 2-Dimensional Footwear Impressions in Blood", Forensic Services Div., May, 1995.
3. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, FBI Laboratory, pg. 23, 1994.
4. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.



## D.F.O

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence		  HARMFUL/IRRITANT		
FORMULA				
D.F.O. Stock Solution	D.F.O. Working Solution	IRCG Formulation		
1 gram D.F.O. crystals 200 ml Methanol 200 ml Ethyl Acetate 40 ml Glacial Acetic acid Combine and stir with a magnetic stirrer until ALL the ingredients are dissolved.	Add Petroleum ether to the stock solution until the total volume is two liters.	<ul style="list-style-type: none"> <li>• 0.25 g DFO</li> <li>• 40 ml methanol</li> <li>• 20 ml acetic acid</li> <li>• 940 ml HFE-7100</li> </ul>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Submerge or spray the item - 5 seconds.</li> <li>2. Air-dry the item in a fume hood.</li> <li>3. Process the item a second time &amp; Air-dry the item in a fume hood.</li> <li>4. Oven bake @ 50 to 100 degrees C for 10 to 20 minutes.</li> <li>5. View under a forensic light source at 495 nm to 550 nm. Absorption Max is 514 nm. View under orange or red barrier filters.</li> <li>6. Photograph results using an orange colored or 550(BP 35) bandpass filter.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
Red-pink ridge detail is observed after applying the chemical and baking the item.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
High humidity or steam cannot interact with the item being processed.  Completely dry the item prior to viewing.	Items which cannot be subjected to baking in an oven at 100 degrees C for 20 minutes.  Not suited for non-porous surfaces and items which have been wet.	Prepare the working solution and apply the reagent in a fume hood.  Highly fluorescent papers, inks and paints may interfere with the fluorescence of the ridge detail. DFO treated porous items may become stained a yellow discoloration after some time.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered plastic-coated bottles.	Fume hood use is required for preparing the working solution and applying the reagent.	Use prior to ninhydrin in the processing sequence.  D.F.O. is considered more sensitive for amino acid detection than is ninhydrin.
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• 1,2-Indanedione</li> <li>• 5-MTN</li> <li>• Ninhydrin</li> </ul>		<u>Not Necessarily in this Order:</u> <ul style="list-style-type: none"> <li>• Physical Developer</li> <li>• Silver Nitrate</li> <li>• Sodium Hypochlorite</li> <li>• Zinc Chloride</li> </ul>

<p><b>CHEMICAL NAME:</b> D.F.O.</p> <p><b>SURFACE USED ON:</b> Dry Porous Documents</p> <p><b>SENSITIVE TO:</b> Amino Acids and Eccrine Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. <b>D.F.O.</b></li> <li>4. Ninhydrin</li> <li>5. Physical Developer</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Fluorescent Technique Raw Wood Surface</p> <p><b>OTHER CHEMICAL NAME(S):</b> 1,8-Diazfluoren-9-one</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) plus months</p>
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### Process Summary:

A technique used prior to Ninhydrin that reacts to amino acids present in latent print residue on porous surfaces. DFO is regarded as capable of developing more ridge detail than Ninhydrin. A fluorescence of the prints is obtained after baking the item in an oven at 100 degrees C, then viewing under a forensic light source.



### **Accepted Deviations:**





A hair dryer or a DRY steam iron may be substituted for a baking oven, if necessary. Do not allow steam to contact the item. Strict control of the humidity is not required. Pentane (instead of Petroleum ether) can be used as the carrier solvent. View the item at 500 nm to 590 nm using red colored goggles to reduce background fluorescence, if necessary.

### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
5. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.
6. Didierjean, C., Debart, M-H, Crispino, F., "New Formulation of DFO in HFE-7100", Fingerprint Whorld, Vol. 24, No. 94, October 1998, pp.163-167.



## ELECTROSTATIC LIFTING

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
				<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
<b>FORMULA</b>				
Not applicable.				
<b>PROCEDURE OF APPLICATION</b>				
<ol style="list-style-type: none"> <li>1. Place the lifting film over the surface bearing the dust impression.</li> <li>2. Place the grounding device adjacent to the lifting film.</li> <li>3. Charge the lifting film with the charger unit.</li> <li>4. The dust impression is transferred to the lifting film by the electrostatic charges.</li> <li>5. Carefully remove the lifting film from the surface.</li> <li>6. View the lifted result using white oblique light.</li> <li>7. Photograph opaque lifting films using white oblique light.</li> <li>8. Photograph transparent lifting films using transmitted light or dark field lighting methods.</li> </ol>				
<b>DEVELOPMENT COMPLETE WHEN</b>				
The lifting film is viewed under white oblique light to observe for dust impression detail.				
<b>SOURCE OF ERROR</b>	<b>INCOMPATIBILITIES</b>	<b>PRECAUTIONS</b>		
Electrostatic lifting devices do not work on wet or moist surfaces.  A good ground connection is necessary for proper performance.	Extremely dusty underlying surfaces.  The device cannot be operated in wet or very moist conditions.	Be sure to let electrostatic charges dissipate before attempting to remove the lifting film.  The dust impression on the lifting film is 'mirror-reversed', and may need to be photographically reversed before comparisons.		
<b>STORAGE CONTAINER</b>	<b>SAFETY</b>	<b>RECOMMENDATIONS</b>		
Lifting films can be stored in cardboard boxes.	Be certain not to handle or touch the charging probes when the device is in operation.  Electric shocks can occur when recovering dust impressions from metal surfaces.	View the lifted impressions using oblique white light in a darkened room.  Re-charge the charger unit on a regular schedule.		



## SEQUENTIAL REAGENT

### Not Necessarily in this Order:

- Iodine Fuming
- Electrostatic Lifting
- Ultra-Violet Light
- Visual Examination

**CHEMICAL NAME:**

Electrostatic Lifting

**SURFACE USED ON:**

Dry Porous & Non-Porous Surfaces

**SENSITIVE TO:**

Dust Impressions

**RIDGE DETAIL VISUALIZED BY:**

Electrostatically recovered impressions

**REAGENT APPLICABILITIES:**

Non-Destructive  
Dust impressions  
Porous surfaces  
Non-Porous surfaces

**OTHER CHEMICAL NAME(S):**

Electrostatic Dust Print Lifter  
Electrostatic Dust Mark Lifting Device  
Dustmark Electrostatic Lifting Kit D.E.L.K  
Dustprint Lifter

**Process Summary:**

A non-destructive process whereby an electric field is developed on a sheet of lifting film which attracts dust particles to the film. The device is capable of recovering dust impressions from a variety of porous and non-porous surfaces. Dust impressions not visible to the naked eye are often recovered with this device.

**Accepted Deviations:**

Numerous electrostatic lifting devices are available. Both ridge detail and footwear impressions may be recovered with this device. Both the "ESDA" and "Electrostatic Vacuum Box" can be utilized to recover dust impressions.







### **Supporting Reference Materials:**

1. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
2. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
3. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## FLUORESCENT LIGHT

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
				<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
Used for:		Centered Wavelengths:		
<ol style="list-style-type: none"> <li>1. Luminescence of natural components in latent print residue.</li> <li>2. Fluorescent fingerprint powders.</li> <li>3. Fluorescent dye stains.</li> <li>4. Darkening blood impressions.</li> <li>5. Fluorescing fluids for refrigerants, transmissions, fuels and coolants.</li> <li>6. Fluorescent physiological fluids.</li> <li>7. Luminesces backgrounds for contrast improvement</li> </ol>		<ol style="list-style-type: none"> <li>A. 300 nm to 400 nm Fluorescing U-V sensitive powders or dyes. Fluorescing physiological fluids. Ardrox excitation.</li> <li>B. 400 nm to 450 nm R.A.Y. excitation. Absorbing blood\bite mark detail. Fluorescing physiological fluids.</li> <li>C. 455 nm to 515 nm Searching on nonfluorescent backgrounds. Basic Yellow 40 excitation. Zinc chloride excitation.</li> <li>D. 550 nm to 590 nm Searching on highly fluorescent backgrounds. DFO excitation.</li> </ol>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Reduce ambient light.</li> <li>2. Aim the light from the Forensic Light Source.</li> <li>3. View the item using Yellow, Red or Orange colored goggles.</li> <li>4. Photograph detail using colored fitters similar to the viewing goggles.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
All the item's surfaces have been examined.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Handing items (by handles) in their normal manner may obliterate or smudge visible detail.	Items that inherently luminescence may quench any fluorescence of the ridge detail.	Ascertain that items do not have liquid or loose components that may spill if the item is subjected to maneuvering.		





STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Not applicable.	Ultra-violet light absorbing protective eyewear must be worn at wavelengths around 350 nm to 415 nm.	Adjusting and tuning the excitation wavelength, along with proper selection of barrier filter, may produce better visualization results.
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Fluorescent Light</li> <li>• Visual Examination</li> </ul>		<u>Not Necessarily in this Order:</u> <ul style="list-style-type: none"> <li>• Iodine Fuming</li> <li>• Electrostatic Lifting</li> <li>• Ultra-Violet Light</li> <li>• Visual Examination</li> </ul>

<p><b>CHEMICAL NAME:</b> Fluorescence Examination</p> <p><b>SURFACE USED ON:</b> Non-Destructive for all surfaces</p> <p><b>SENSITIVE TO:</b> Absorption/Emittance of various light wavelengths</p>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces Non-Destructive</p> <p><b>OTHER CHEMICAL NAME(S):</b> Alternate Light Source Forensic Light Source Laser</p>
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### Process Summary:

A non-destructive technique to note the presence of visible detail. Several models of Forensic Light Sources are available, most of which provide an excitation wavelength range from 350 nm to 600 nm. Improved viewing of the ridge detail is accomplished either by rendering the ridge detail darker upon viewing in an absorption mode, or, through fluorescence of the ridge detail which is either rendered luminescent when exposed to the light, or made fluorescent by the addition of chemicals. Orange, Red or Yellow viewing barrier filters (viewing goggles) are used for viewing or during photography of the detail. The goal of Fluorescent examinations is to achieve the maximum fluorescence of the ridge detail with the minimum of background fluorescence/reflection.



### **Accepted Deviations:**





Adjusting the wavelength of the light source may produce better visualization results. Different manufacturers produce products that provide excitation wavelengths at different pre-selected wavelengths, and over different wavelength range.

### **Supporting Reference Materials:**

1. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
2. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.



## GENTIAN VIOLET

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Purple				<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
Formula #1:		Formula #2:		
1 ml Gentian Violet solution in 1000 ml distilled water.		1 g Gentian Violet crystals in 1000 ml distilled water.		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Pass the item through a Tray containing the reagent solution for 1 to 2 minutes.</li> <li>2. Cold tap water rinse - 30 seconds.</li> <li>3. View visually, or with a forensic light source between 505 nm - 570 nm with red goggles.</li> <li>4. CLEARING SOLUTION: 100 ml Hydrochloric acid in 90 ml of tap water. (10% solution)</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
After a purple color is noted, and repeated applications no longer produce enhancement of ridge detail.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
<p>This is a non-specific protein stain.</p> <p>Weak, exhausted working solutions are ineffective.</p>	<p>Porous surfaces that strongly absorb the dye stain.</p> <p>Tapes containing adhesives which are water-soluble should be avoided.</p>	<p>Color of stained latent prints fade under strong photo lights or sun light.</p> <p>This is a messy technique involving a dye that is difficult to remove from clothing, counter tops and skin.</p>		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark or Clear stoppered glass bottles.	<p>Don't get any solution on any open wound on your body!!!</p> <p>This reagent is very TOXIC by swallowing or skin contact.</p>	<p>Most effective on recently deposited, 'fresh' latent prints on tapes.</p> <p>Developed detail may be viewed with forensic light source to improve contrast.</p>		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• • Liqui-Drox</li> <li>• Liqui-Nox</li> <li>• Sticky-Side Powder</li> <li>• Sudan Black</li> </ul>	Not Necessarily in this Order: <ul style="list-style-type: none"> <li>• Liqui-Drox</li> <li>• Liqui-Nox</li> </ul>

<p><b>CHEMICAL NAME:</b> Gentian Violet</p> <p><b>SURFACE USED ON:</b> Non-Porous surfaces, especially the adhesive side of tapes</p> <p><b>SENSITIVE TO:</b> Epithelial skin cells, Sebaceous lipids &amp; Proteins</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. <b>Gentian Violet</b></li> <li>4. Liqui-Drox</li> <li>5. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Tape Surfaces Non-Porous Surfaces Fluorescent Techniques</p> <p><b>OTHER CHEMICAL NAME(S):</b> Crystal Violet Crystal Violet Chloride Aniline Violet Basic Violet 3 Bismuth Violet</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>
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### Process Summary:

This is a dye staining process using a water-based working solution. The evidence is repeatedly stained and rinsed until optimum development occurs. This reagent may be applied to surfaces that are contaminated with oils and grease.

### Accepted Deviations:

The working solution may be re-used. The working solution may also be applied by brushing. The developed detail may be viewed under a forensic light source at 505 nm to 570 nm using red viewing goggles.








### **Supporting Reference Materials:**

1. "A Modified Crystal Violet Application Technique for Black Electrical Tape", Journal Forensic Identification, Vol. 40, No. 3, pg. 148.
2. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
3. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
4. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
5. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
6. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## GUN BLUING

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Black</b>		 HARMFUL/IRRITANT		
FORMULA				
Formula 44/40 (Instant Gun Blue):			Outer's Gun Blue	
1 part reagent to 80 parts distilled water			1 part reagent to 40 parts distilled water	
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Briefly fume cartridges with cyanoacrylate ester.</li> <li>2. Immerse cartridges in Gun Blue reagent.</li> <li>3. Monitor for development.</li> <li>4. Halt development by immersing in distilled water.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
The development of black ridge detail occurs rapidly once the development process begins.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Cartridges must be made of nickel or brass metals.  Cartridges must be fumed with cyanoacrylate ester prior to immersion into gun bluing.	Reagent does not work on lacquered steel cartridges.	Watch for over development. Ridge detail develops quickly once the reaction begins.  The development may interfere with breech face markings necessary for firearms examinations.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Made fresh with each application.	Fume hood use is required.	Be sure to continuously monitor the cartridges for development of ridge detail. Remove from reagent once development is visible.		



<p><b>CHEMICAL NAME:</b> Gun Bluing</p> <p><b>SURFACE USED ON:</b> Brass or Nickel Cartridge Surfaces</p> <p><b>SENSITIVE TO:</b> Eccrine/Sebaceous Components</p>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces Cartridges Surface</p> <p><b>OTHER CHEMICAL NAME(S):</b> Brass Black metal Touch Up BB2 Formula 44/40 Instant Gun Blue Gunslick Gun Blue Perma Blue Liquid Gun Blue PB 22 Super Blue Extra Strength</p>
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**Process Summary:**

A number of gun bluing products sold under various trade names are used in a diluted solution to develop ridge detail on cartridge surfaces. Cartridges are first fumed with cyanoacrylate ester, then immersed into the gun bluing solution.

**Accepted Deviations:**









Several gun bluing products sold under various trade names may be utilized.

**Supporting Reference Materials:**

1. Minutiae Magazine, Issue No. 32, Sept.-Oct. 1995, pg. 1.



## 1,2 INDANEDIONE

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence	  Orange or Red Filter	  HARMFUL/IRRITANT	 	
FORMULA				
(mix in the following order)				
<ol style="list-style-type: none"> <li>1. 2 g of 1,2-Indanedione</li> <li>2. 70 ml of Ethyl acetate</li> <li>3. 930 ml of HFE 7100</li> </ol>				
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Dip, spray or wash the item in the reagent.</li> <li>2. Air-dry the item (3 minutes).</li> <li>3. Oven bake at 100 degrees C for 10 - 20 minutes at 60% relative humidity or with no added humidity.</li> <li>4. View under a forensic light source: For most papers ..... View @ 515 nm (green light) with orange barrier filter. For manila, brown paper bags, cardboard items &amp; craft paper .... View @ 515 - 570 nm with orange or red barrier filters.</li> <li>5. ** OPTION ** Spray lightly with Zinc chloride, and/or cool the treated item with liquid Nitrogen. View with forensic light source.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
<p>A light pink color is noted after baking the item.</p> <p>Viewing under a forensic light source with appropriate barrier filter produces a strong fluorescence.</p>				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
<p>Use of acetic acid in the formula may produce an adverse reaction contributing towards a deterioration of the mixture.</p> <p>Unstable (expired) working solutions may be inadequate for proper ridge detail development.</p>	<p>Not suited for non-porous surfaces or porous items which have been wet.</p> <p>Items which may deteriorate when oven-baked at 100 degrees C for 10 - 20 minutes.</p> <p>This reagent performs poorly on low quality papers such as like newspapers, cardboard, and recycled paper.</p>	<p>Avoid exposing the treated item to intense light or sunlight, since photochemical reactions may cause photoionization of the reagent and less-intense fluorescence.</p> <p>Keep the treated evidence items under darkened conditions until all the proper recording (photographic and-or digital) have been performed.</p>		





STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass bottles.	Fume hood use is required for reagent preparation and application.	<p>Fluorescence of the ridge detail may be restored after storing the treated item in the dark overnight.</p> <p>Zinc chloride treatment should improve the fluorescence of the 1,2-Indanedione developed ridge detail.</p> <p>When choosing between this reagent and ninhydrin, this reagent should be used as the primary reagent.</p>
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• D.F.O.</li> <li>• 5-MTN</li> <li>• Ninhydrin</li> </ul>		<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• Physical Developer</li> <li>• Silver Nitrate</li> <li>• Sodium Hydrochlorite</li> <li>• Zinc Chloride</li> </ul>

<p><b>CHEMICAL NAME:</b> 1,2-Indanedione</p> <p><b>SURFACE USED ON:</b> Dry Porous Documents</p> <p><b>SENSITIVE TO:</b> Amino Acids and Eccrine Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. <b>1,2-Indanedione</b></li> <li>4. Forensic Light</li> <li>5. Zinc chloride/Liquid Nitrogen</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Amino Acid Developer Fluorescent Technique Raw Wood Surface</p> <p><b>OTHER CHEMICAL NAME(S):</b> 5,6-dimethoxy-1,2-indanedione</p>
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### **Process Summary:**

An amino acid sensitive reagent that is comparable to D.F.O. processing. Ridge detail developed with 1,2-Indanedione will fluoresce yellow 515 - 570 nm. Optimum viewing and photographing are done with an orange or red barrier filter. Post-treatment can be performed with Zinc chloride to improve the fluorescence of the ridge detail. Reports suggest that 1,2-Indanedione upon Zinc chloride treatment and cooling with liquid nitrogen produces superior fluorescence of ridge detail as compared to DFO.

Little discoloration of the treated porous items can be expected with this reagent as compared to the yellow discoloration that may be seen with DFO treated paper items.

### **Accepted Deviations:**






Pentane, Heptane or HFE-7100 can be substituted for Petroleum ether as the carrier solvent.

### **Supporting Reference Materials:**

1. Ramotowski, R.; Cantu, A.A.; Joullié, M.M.; Petrovskaia, O. "1,2-Indanediones: A Preliminary Evaluation of a New Class of Amino Acid Visualizing Compounds", *Fingerprint Whorld*, Vol. 23, No. 90, 1997, pp. 131-140.
2. Almog, J., Springer, E., Wiesner, S., Frank, A. et al., "Latent Fingerprint Visualization by 1,2-Indanedione and Related Compounds: Preliminary Results", *Jor. of Forensic Sciences*, Vol. 44, No. 1, 1999, pp. 114-118.
3. *Minutiae Magazine*, Summer Special 1994, Issue No. 24, pg.7.
4. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
5. Roux C., Jones, N., Lennard C., Stoilovic, M., "Evaluation of 1,2-indanedione and 5,6-dimethoxy-1,2-indanedione for the Detection of Latent Fingerprints on Porous Surfaces", *Jor. of Forensic Sciences*, Vol. 45, No. 4, 2000, pp. 761-769.
6. Kasper, S., Minnillo, D., Rockhold, A., "Validating IND (1,2-indanedione)", *For. Sci. Communications*, Vol. 4, No. 4, Oct. 2002.
7. Wiesner, S., Almog, J., Sasson, Y., Springer, E., "Chemical Development of Latent Fingerprints: IND has come of age", *Jor. of Forensic Sciences*, Vol. 46, No. 5, 2001, pp. 1082-1084.



## IODINE FUMING

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence				
<b>FORMULA</b>				
<p>Several commercial models of Iodine Fuming kits and chambers are available. Read manufacturer's instructions. Pack about 1/2 teaspoon of iodine crystals into the fuming kit/chamber. Follow the manufacturer's instructions.</p>				
<b>PROCEDURE OF APPLICATION</b>				
<ol style="list-style-type: none"> <li>1. Prepare the photographic set-up by pre-setting camera lighting, aperture and shutter speed.</li> <li>2. Low temperature heat is required to sublimate the iodine crystals into fumes.</li> <li>3. Pass the fumes over the surface to be examined.</li> <li>4. Photograph any developed detail immediately.</li> </ol>				
<b>DEVELOPMENT COMPLETE WHEN</b>				
<p>Maximum yellow-brown detail is developed upon exposure to iodine fumes.</p>				
<b>SOURCE OF ERROR</b>	<b>INCOMPATIBILITIES</b>	<b>PRECAUTIONS</b>		
<p>Sufficient low temperature heat is required to create the violet colored iodine fumes from the iodine crystals.</p> <p>Moisture removing agents such as Calcium carbonate are needed to assure that dry fumes are created.</p>	<p>Items cannot be processed with cyanoacrylate prior to iodine fuming.</p> <p>Metal items that would corrode upon exposure to iodine fumes.</p> <p>Developed detail may not be readily visible on dark surfaces.</p>	<p>Do not breathe or inhale iodine fumes.</p> <p>Do not allow iodine fumes to contact any photography equipment which is nearby.</p>		
<b>STORAGE CONTAINER</b>	<b>SAFETY</b>	<b>RECOMMENDATIONS</b>		
<p>Dark stoppered glass bottles.</p>	<p>Iodine fumes are labeled as TOXIC and CORROSIVE. Do not inhale the fumes. Use a Fume hood, or use in a well-ventilated area.</p>	<p>It is necessary to have previously set-up the photography that will be used to record any developed detail.</p>		



### SEQUENTIAL REAGENT

- D.F.O.
- Ninhydrin
- Physical Developer

**CHEMICAL NAME:**

Iodine Fuming

**SURFACE USED ON:**

Porous & Non-Porous Surfaces

**SENSITIVE TO:**

Fatty & Oily Components

**ABRIDGED REAGENT SEQUENCE:**

1. Visual Examination
2. Forensic Light
3. Iodine Fuming
4. Ninhydrin
5. Physical Developer

**RIDGE DETAIL VISUALIZED BY:**

Visible Chemical/Stain Reaction

**REAGENT APPLICABILITIES:**

Non-Porous Surfaces  
Porous Surfaces  
Raw Wood Surfaces

**OTHER CHEMICAL NAME(S):**

Iodine Vapor

**WORKING SOLUTION SHELF-LIFE:**

Indefinite

**Process Summary:**

A non-destructive fuming technique that can be used on porous and non-porous surfaces. The developed ridge detail dissipates quickly, so it is necessary to have previously set-up the photography that will be used to record any developed detail. Several commercial kits are available to be used for iodine fuming.

**Accepted Deviations:**

A "Liquid Iodine" method may be used if it is necessary to retard the dissipation of the developed detail, however the "non-destructive" character of iodine fuming is lost due to the application of liquid chemicals to the surface.

Fixing solutions containing Naphthoflavone can be applied. The application of this solution will interfere with sequential reagents.








### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.  
"Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
2. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
3. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
4. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## LEUCOCRYSTAL VIOLET

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Purple		 HARMFUL/IRRITANT		
FORMULA				
Formula "A":		Formula "B":		
<ol style="list-style-type: none"> <li>(Solution A) 10g 5-Sulfosalicylic Acid dissolved in 100 ml distilled water</li> <li>(Solution B) add Solution A to 400 ml 3% Hydrogen Peroxide</li> <li>(Working Solution) add .75 g Leucocrystal violet dye to Solution B stirring the mixture vigorously.</li> </ol>		<ol style="list-style-type: none"> <li>10g 5-Sulfosalicylic Acid dissolved in 500 ml 3% Hydrogen Peroxide</li> <li>add 3.7 g Sodium acetate</li> <li>add 1.0 g Leucocrystal violet dye stirring the mixture vigorously.</li> </ol>		
PROCEDURE OF APPLICATION				
Spray the blood impression using a fine-mist sprayer. Development should occur in 30 seconds.				
DEVELOPMENT COMPLETE WHEN				
Rapid impression enhancement to a violet color from the colorless form of the reagent.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Background development of the item may occur under intense light due to photoionization of the dye.  L.C.V. may react to other substances not specific to blood.	<p>Porous items that strongly absorb the dye. Excessively blood-stained items.</p> <p>Cyanoacrylate fuming may be detrimental to this procedure.</p> <p>The D.A.B. process for blood enhancement should not be performed before this reagent is applied.</p>	<p>The application of excess reagent may result in leaching of the impression, therefore apply the reagent using the finest misting device available.</p> <p>Photograph any enhanced impressions subject to sunlight shortly after development, due to photoionization concerns.</p>		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark stoppered glass or plastic bottles.	<p>The reagent should be prepared in a fume hood.</p> <p>Use in a well-ventilated area.</p>	This is the reagent of choice when you want to process a large area without any concerns for cleaning up from any rinse solution.		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> <li>• Coomassie Blue</li> <li>• Crowle's Double Stain</li> <li>• D.A.B.</li> </ul>	<ul style="list-style-type: none"> <li>• Amido Black - Methanol Base</li> <li>• Amido Black - Water Base</li> <li>• Coomassie Blue</li> </ul>

<p><b>CHEMICAL NAME:</b> Leucocrystal Violet</p> <p><b>SURFACE USED ON:</b> Blood-Stained Surfaces</p> <p><b>SENSITIVE TO:</b> Hemoglobin in Blood</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Ultra-Violet Light</li> <li>4. <b>Leucocrystal Violet</b></li> <li>5. Forensic Light</li> <li>6. Amido Black</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces Blood Enhancement Post Ninhydrin</p> <p><b>OTHER CHEMICAL NAME(S):</b> L.C.V.</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> One (1) month</p>
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### Process Summary:

A quick and uncomplicated method to enhance blood through the catalytic oxidation of the dye, while simultaneously fixing and enhancing the blood impression.

Other blood enhancement techniques such as Amido Black may be applied after this technique.

### Accepted Deviations:






The working solution may be lightly blotted 30 seconds after its application. Once the impression is blotted, the reagent may be lightly applied again.

### Supporting Reference Materials:

1. Fisher, John F., "An Aqueous Leucocrystal Violet Enhancing Reagent for Blood Impressions".
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Bodziak, William J., "Use of Leucocrystal Violet to Enhance Shoe Prints in Blood", Forensic Science International, Vol.82, No.1, Sept. 1996.



## LIQUI-DROX

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence	 Yellow or 2A Filter	 HARMFUL/IRRITANT <b>NOTICE</b> EYE DAMAGE MAY OCCUR DO NOT VIEW PROCESS WITHOUT SHADES IN PLACE	 UV Eye Protection	 Yes No
FORMULA				
<ul style="list-style-type: none"> <li>• 200 ml Ardrox P-133D</li> <li>• 400 ml Liqui-Nox</li> <li>• 400 ml distilled water</li> </ul> Combine and stir the chemicals thoroughly. A thick milky-yellow solution should result.				
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Using a camel hair brush, apply the reagent onto both sides of the tape until a lather is produced.</li> <li>2. Wait approximately 10 seconds.</li> <li>3. Rinse under a gentle stream of cold tap water.</li> <li>4. Allow the tape to air dry.</li> <li>5. View under a Forensic Light Source or Ultra-Violet lamp able to produce a long-wave ultraviolet light output. Use ultra-violet protection, yellow or orange colored goggles.</li> <li>6. Photograph results using an ultra-violet blocking 2A filter.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
The tape must first be processed with cyanoacrylate fumes prior to applying this reagent.  A clear-colored reagent solution which has been standing for some time should be stirred to restore its thick milky-yellow color prior to use.	Items that inherently fluoresce in the long-wave Ultra-violet range will interfere with the dye stain fluorescence.	Stir the working solution thoroughly to restore its thick milky-yellow color prior to use.		





STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass or plastic bottles.	Use Ultra-violet protection goggles when working with long-wave ultra-violet light sources.  Prepare the working solution in a Fume hood.	Photograph the developed ridge detail immediately. Exposure to ultra-violet light for a lengthy time will cause the developed impression to fade.
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Gentian Violet</li> <li>• Liqui-Drox</li> <li>• Liqui-Nox</li> <li>• Sticky-Side Powder</li> </ul>		<u>Not Necessarily in this Order:</u> <ul style="list-style-type: none"> <li>• M.R.M. 10</li> <li>• R.A.M.</li> <li>• R.A.Y.</li> </ul>

<p><b>CHEMICAL NAME:</b> Liqui-Drox</p> <p><b>SURFACE USED ON:</b> Dark colored tapes, adhesive &amp; non-adhesive sides</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. <b>Liqui-Drox</b></li> <li>5. Ultra-Violet Lamp</li> <li>6. R.A.M.</li> <li>7. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Ultra-Violet light induced</p> <p><b>REAGENT APPLICABILITIES:</b> Post Cyanoacrylate Non-Porous surfaces Tape Technique</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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### Process Summary:

Effective for dark-colored adhesive tapes, the Liqui-Drox method is a post-cyanoacrylate process involving brushing the reagent onto tape, rinsing, then viewing the result under long-wave ultra-violet light. This reagent is composed of a mixture of a fluorescent agent, a detergent and water.



### **Accepted Deviations:**





None

### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Hollars, M., Trozzi, T., and Barron, B., "Development of Latent Fingerprints on Dark Colored Sticky Surfaces Using Liqui-Drox", Jor.
4. Forensic Identification, Vol. 50, No. 4, July/Aug 2000, pp. 357-362.



## LIQUI-NOX

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
Dark Grey 				<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
<b>FORMULA</b>				
(In a shallow bowl mix) <ul style="list-style-type: none"> <li>• 20 drops tap water</li> <li>• 20 drops Liqui-Nox</li> <li>• 0.5 g black fingerprint powder</li> </ul>				
<b>PROCEDURE OF APPLICATION</b>				
<ol style="list-style-type: none"> <li>1. Mix the ingredients to create a foam with bubbles.</li> <li>2. Use a camel hairbrush to paint the tape surface with the mixture.</li> <li>3. Wait 30 to 60 seconds.</li> <li>4. Rinse tape under a gentle stream of tap water. Allow the tape to air dry.</li> <li>5. Photograph any developed detail.</li> </ol>				
<b>DEVELOPMENT COMPLETE WHEN</b>				
Ridge detail is developed upon a water rinse.				
<b>SOURCE OF ERROR</b>	<b>INCOMPATIBILITIES</b>	<b>PRECAUTIONS</b>		
The consistency of the reagent mixture should be as that of 'shaving cream with small bubbles'.	Dark colored tapes should be processed using gray fingerprint powder in the reagent mixture instead of black fingerprint powder.	Practice getting the proper consistency of the reagent mixture prior to use in casework.		
<b>STORAGE CONTAINER</b>	<b>SAFETY</b>	<b>RECOMMENDATIONS</b>		
The reagent is mixed fresh with each new application.	Avoid getting any reagent into your eyes.	It may be helpful to grind the dried reagent mixture in a mortar before adding water.		
<b>SIMILAR REAGENT</b>		<b>SEQUENTIAL REAGENTS</b>		
<ul style="list-style-type: none"> <li>• Gentian Violet</li> <li>• Small Particle Reagent</li> <li>• Sudan Black</li> <li>• Sticky-Side Powder</li> </ul>		Not Necessarily in this Order: <ul style="list-style-type: none"> <li>• Liqui-Drox</li> <li>• Small Particle Reagent</li> </ul>		



<p><b>CHEMICAL NAME:</b> Liqui-Nox</p> <p><b>SURFACE USED ON:</b> Adhesive Tape Surfaces</p> <p><b>SENSITIVE TO:</b> Sebaceous/Eccrine Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"><li>1. Visual Examination</li><li>2. Forensic Light</li><li>3. Gentian Violet</li><li>4. <b>Liqui-Nox</b></li><li>5. Liqui-Drox</li><li>6. Forensic Light</li></ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous surfaces Tape Surfaces</p> <p><b>OTHER CHEMICAL NAME(S):</b> Alternate Black Powder</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Prepared as needed</p>
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#### **Process Summary:**

Liqui-Nox is a laboratory glassware soap that is used to create a soap/powder foam that is painted onto adhesive tape surfaces.

#### **Accepted Deviations:**







The reagent mixture can be prepared, then allowed to be dried to produce a residue. This dried residue can be reconstituted by the addition of tap water until the desired consistency is obtained. Ash Gray fingerprint powder can be used in place of black fingerprint powder to develop ridge detail on black electrical tapes.

#### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
5. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## M.B.D.

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Orange Fluorescence		 		
FORMULA				
Stock Solution:		MBD Working Solution (Combine in the order listed)		
1 g M.B.D. powder dissolved in 1 liter Acetone		<ul style="list-style-type: none"> <li>• 10 ml M.B.D. Stock Solution</li> <li>• 30 ml Methanol</li> <li>• 10 ml Isopropanol</li> <li>• 950 ml Petroleum ether</li> </ul>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Spray, immerse or use a squirt bottle to apply the M.B.D. solution to the item.</li> <li>2. View under a Forensic Light Source in the 435 nm to 535 nm range. Use orange colored goggles.</li> <li>3. Photograph results using orange barrier filter.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the 515 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark stoppered glass or plastic bottles.	Fume hood use is required when preparing and applying this reagent.	<p>The recommended procedure of application is to immerse the item in a tray of the dye.</p> <p>A rinse using Methanol may be necessary to reduce excessive staining by the dye.</p>		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• Nile Red</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> <li>• Thenoyl Europium Chelate</li> </ul>	<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• M.R.M. 10</li> <li>• R.A.M.</li> <li>• R.A.Y.</li> </ul>

<p><b>CHEMICAL NAME:</b> M.B.D.</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. <b>M.B.D.</b></li> <li>5. Forensic Light</li> <li>6. M.R.M. 10</li> <li>7. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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**Process Summary:**

A fluorescent dye-stain used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light between 435 nm and 535 nm is required for this process.

**Accepted Deviations:**

The wavelength at which fluorescence is optimized is adjusted in accordance to the personal preference of the examiner.










### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
5. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## M.R.M. 10

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Orange Fluorescence	 	 		
FORMULA				
Stock Solution A:	Stock Solution B:	Stock Solution C:	M.R.M. 10 Working Solution	
1 g Rhodamine 6G powder dissolved in 1 liter of Methanol.	2 g Basic Yellow 40 dissolved in 1 liter of Methanol.	1 g M.B.D. powder dissolved in 1 liter of Acetone.	(Combine in the order listed) 3 ml Stock Solution A. 3 ml Stock Solution B. 7 ml Stock Solution C. 20 ml Methanol 10 ml Isopropanol 8 ml Acetonitrile 950 ml Petroleum ether	
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Spray, immerse or use a squirt bottle to apply the M.R.M. 10 solution to the item.</li> <li>2. Examination under a laser or Forensic Light Source at 430 nm to 530 nm. Use orange colored goggles.</li> <li>3. Photograph results using an orange colored or 550(BP 35) bandpass filter.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the 490 nm to 555 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		





STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass or plastic bottles.	Fume hood use is required when preparing and applying this reagent.	<p>The recommended procedure of application is to immerse the item in a tray of the dye.</p> <p>A rinse using Methanol may be necessary to reduce excessive staining by the dye.</p>
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• Nile Red</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> <li>• Thenoyl Europium Chelate</li> </ul>		<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• R.A.M.</li> <li>• R.A.Y.</li> </ul>

<p><b>CHEMICAL NAME:</b> M.R.M. 10</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. Rhodamine 6G</li> <li>5. Forensic Light</li> <li>6. <b>M.R.M. 10</b></li> <li>7. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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### Process Summary:

A mixture of fluorescent dye-stains used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light between 430 nm and 530 nm is required for this process.

**Accepted Deviations:**







Spray, immerse or use a squirt bottle to apply the M.R.M. 10 solution to the cyanoacrylate-fumed item.

**Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.



## 5-MTN

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Purple		  HARMFUL/IRRITANT		
FORMULA				
1. 3 g of 5-MTN crystals 2. 1000 ml petroleum ether				
PROCEDURE OF APPLICATION				
1. a) Submerge item in reagent - 5 seconds. b) Brush solution onto item - until coated. c) Spray solution onto item - until coated. 2. Heat up to 80 degrees C & humidity exposure @ 60% - 70% relative humidity. Monitor for development or use a steam iron. 3. Photograph the developed detail using a green-colored (Wratten #58) filter. 4. View non-Zinc chloride latent prints under a Forensic Light Source at 530 nm using no barrier filter. 5. Item may be treated with Zinc chloride (see Zinc chloride pg.) View under a Forensic Light Source at 530 nm using orange barrier filter.				
DEVELOPMENT COMPLETE WHEN				
The ridge detail becomes visible as a purple color, and the item's background begins to stain a purple color. When treated with Zinc chloride, the ridge detail turns a reddish-purple color.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Expired working solutions may be inadequate for proper ridge detail development.	Not suited for non-porous surfaces, or, for items which have been water-soaked.  Surfaces that have high animal or plant protein content such as leather and currency will produce extensive background development.	The developed ridge detail dissipates slowly, so photograph any developed ridge detail deemed suitable.  Some solvents (acetone) will cause the ink on documents to run.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass bottles.	Fume hood use is required for reagent preparation and application.	The fluorescence of 5-MTN / Zinc chloride ridge detail is reportedly stronger than for DFO treated items.
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• D.F.O.</li> <li>• 1,2-Indanedione</li> <li>• Ninhydrin</li> </ul>		<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• Physical Developer</li> <li>• Silver Nitrate</li> <li>• Sodium Hydrochlorite</li> <li>• Zinc Chloride</li> </ul>

<p><b>CHEMICAL NAME:</b> 5-MTN</p> <p><b>SURFACE USED ON:</b> Porous surfaces, especially paper and cardboard</p> <p><b>SENSITIVE TO:</b> Amino Acids Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. D.F.O.</li> <li>4. <b>5-MTN</b></li> <li>5. Zinc-Chloride</li> <li>6. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces</p> <p><b>OTHER CHEMICAL NAME(S):</b> 5-Methylthioninhydrin</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Twelve (12) months</p>
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### Process Summary:





A reagent for processing paper evidence that is similar to ninhydrin, also developing purple colored ridge detail. Reportedly, this reagent's purple color is stronger than is ninhydrin's Ruhemann's purple. 5MTN latent prints post-treated with Zinc chloride become more fluorescent than DFO's luminescence.

### Accepted Deviations:

Other alcohol solvents can be used.



## NICKLE NITRATE

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Brown</b>		 HARMFUL/IRRITANT		<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
Formula "A" (1.0% Solution):	Formula "B" (3.0% Solution):	Formula "C" (Alcohol-based solution)		
<ul style="list-style-type: none"> <li>• 1 g of Silver Nitrate</li> <li>• 100 ml of distilled water</li> </ul>	<ul style="list-style-type: none"> <li>• 30 g of Silver Nitrate</li> <li>• 1000 ml of distilled water</li> </ul>	<ul style="list-style-type: none"> <li>• 30 g of Silver Nitrate</li> <li>• 100 ml of distilled water</li> <li>• 1000 ml of Ethanol</li> </ul>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. a) Tray immersion of item for 5 seconds. b) Reagent solution brushed onto item until coated.</li> <li>2. Air dry for 20 minutes.</li> <li>3. Sunlight or U.V. light exposure at 366 nm for ten to sixty minutes. Continuously monitor for development.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
Discontinue the processing before any dark-brown background staining begins to cause the developed detail to lose contrast.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
<p>Wet surfaces may have had their chloride components dissolved away.</p> <p>Silver Nitrate is a non-specific chloride developer.</p>	<p>Items which have been wet may be leached of their chloride and salt impressions.</p> <p>Surfaces that have high chloride or salt compounds coating their surfaces or imbedded in them will produce unacceptable background staining.</p>	<p>High background staining may occur rapidly once the evidence is subjected to sunlight.</p>		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass bottles.	Use U.V. blocking eyewear when developing detail under U.V. light.  Do not allow the reagent to contact your skin.	Be sure to have the photographic set-up standing by once you begin the development process, else overdevelopment may occur before you have a chance to photograph the developed detail.
SEQUENTIAL REAGENTS		
<ul style="list-style-type: none"> <li>• Ultra-Violet Light</li> </ul>		

<p><b>CHEMICAL NAME:</b> Silver Nitrate</p> <p><b>SURFACE USED ON:</b> Porous Surfaces (Wood) that have not been wet</p> <p><b>SENSITIVE TO:</b> Chloride &amp; Salt Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Ninhydrin</li> <li>4. Silver Nitrate</li> <li>5. Ultra-Violet Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Ultra-Violet Light induced</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Twelve (12) months</p>
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### Process Summary:

This process works by having sunlight develop the impression detail treated with the working solution. Background staining is a problem; thus, the technique is not in wide use. The technique has its successes when used on wood surfaces that have *not* been treated with wax or varnish finishes.

### Accepted Deviations:

The concentration of the reagent may be increased up to 5%. Ultraviolet light can be used instead of sunlight to develop the detail. The working solution may be applied by spraying, dipping or brushing.










### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Cowger, J.R. (1983), "Friction Ridge Skin", Elsevier, Page 99.
4. Olsen, R.D. (1978), "Scott's Fingerprint Mechanics", Charles C. Thomas, Pg. 291.
5. Keedwell, E., et. al. (1988), "Chemical Methods for Enhancement of Footwear Marks", Metropolitan Police Forensic Science Lab., Report No. 73, page 19.
6. Cassidy, M.J., Footwear Identification, Lightning Powder Co., Salem, Oregon, pg.59, 1995.



## NILE RED

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Orange Fluorescence	  Orange Filter	  HARMFUL/IRRITANT		
FORMULA				
1. 100 mg Nile red dye 2. 1000 ml Ethanol				
PROCEDURE OF APPLICATION				
1. Spray, dip, or use a squirt bottle to apply the Nile Red solution to the item.  2. Examination under a laser or Forensic Light Source at 450 nm to 560 nm. Absorption Max is at 530 nm. Use orange or red colored goggles.  3. Allow the item to air dry.  4. Photograph results using an orange or bandpass 550(BP35) barrier filter.				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the 530 nm to 590 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark stoppered glass or plastic bottles.	Fume hood use is required when preparing and applying this reagent.	The recommended procedure of application is to immerse the item in a tray of the dye.  A rinse using Methanol may be necessary to reduce excessive staining by the dye.		





SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"><li>• Ardrox</li><li>• Basic Yellow 40</li><li>• Basic Red 28</li><li>• Liqui-Drox</li><li>• M.B.D.</li><li>• Rhodamine 6G</li><li>• Safranin O</li><li>• Thenoyl Europium Chelate</li></ul>	<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"><li>• M.R.M. 10</li><li>• R.A.M.</li><li>• R.A.Y.</li></ul>

<p><b>CHEMICAL NAME:</b> Nile Red</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"><li>1. Visual Examination</li><li>2. Forensic Light</li><li>3. Cyanoacrylate Fuming</li><li>4. Nile Red</li><li>5. 5. Forensic Light</li><li>6. R.A.M.</li><li>7. Forensic Light</li></ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> Nile Blue Oxazone</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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### Process Summary:

A fluorescent dye-stain used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light between 450 nm to 560 nm is required for this process.

### Accepted Deviations:

A number of organic solvents such as n-Heptane, xylene, chloroform, acetone and ethanol may be used to dissolve the Nile red dye. The excitation wavelength may be varied to determine which produces the best fluorescence.









### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. Day, K. and Bowker, W., "Enhancement of Cyanoacrylate Developed Latent Prints Using Nile Red", Jor. Forensic Identification, Vol. 46, No. 2, March/ April 1996, pp. 183-187.



## NINHYDRIN

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Purple</b>		  HARMFUL/IRRITANT		
FORMULA				
Formula #1:		Formula #2:		
<ul style="list-style-type: none"> <li>12.5g Ninhydrin crystals dissolved in 1L alcohol solvent.</li> </ul>		<ul style="list-style-type: none"> <li>Use a magnetic stirring device.</li> <li>5g ninhydrin crystals</li> <li>Dissolve in 30 ml Methanol</li> <li>Add - 40 ml 2-Propanol</li> <li>Add - 930 ml Petroleum ether</li> </ul> <p>Or use any commercial spray unit.</p>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li> <ol style="list-style-type: none"> <li>Tray immersion of item - 5 seconds</li> <li>Brush solution onto item - until coated.</li> <li>Spray solution onto item - until coated.</li> </ol> </li> <li>Heat up to 80 degrees C &amp; humidity exposure 60% - 70% relative humidity. Monitor for development or use a steam iron.</li> <li>Photograph the developed detail using a green colored filter.</li> <li>View under Forensic Light Source               <ol style="list-style-type: none"> <li>530 nm - 555 nm (no filter)</li> <li>490 nm - 505 nm (orange filter)</li> <li>590 nm (red filter)</li> <li>* Ninhydrin on manila file folder: 450 nm with orange filter.</li> </ol> </li> </ol>				
DEVELOPMENT COMPLETE WHEN				
The ridge detail becomes visible as a purple color, and the item's background begins to stain a purple color.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Heat up to 80 degrees C and humidity at 60% to 70% relative humidity should be introduced in order to catalyze the development.	Not suited for non-porous surfaces, or, for items which have been water-soaked.	The developed ridge detail dissipates slowly, so photograph any developed ridge detail deemed suitable.		



<p>Ninhydrin is a non-specific amino acid developer, thus most body fluids and items containing vegetable oils (inks) will be developed by ninhydrin.</p>	<p>Surfaces that have high animal or plant protein content such as leather and currency will produce extensive background development.</p>	<p>Some solvents (acetone) will cause the ink on documents to run.</p> <p>Be alert for checks containing fingerprint watermarks that will develop with ninhydrin.</p>
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
<p>Dark stoppered glass bottles.</p>	<p>Fume hood use is required for preparing and applying the working solution.</p> <p>Ninhydrin is an irritant if inhaled.</p>	<p>The ninhydrin treated item should be dried before subjecting to humidity.</p> <p>View the developed ridge detail under a forensic light source at 530 nm before determining that the latent print is of no value</p> <p>Ninhydrin can also serve as a blood enhancement reagent.</p>
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• D.F.O.</li> <li>• 5-MTN</li> </ul>		<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• Physical Developer</li> <li>• Silver Nitrate</li> <li>• Sodium Hydrochlorite</li> <li>• Zinc Chloride</li> <li>• Nickel Nitrate</li> </ul>

<p><b>CHEMICAL NAME:</b> Ninhydrin</p> <p><b>SURFACE USED ON:</b> Porous surfaces, especially paper and cardboard</p> <p><b>SENSITIVE TO:</b> Amino Acids and Proteins</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. D.F.O.</li> <li>4. <b>Ninhydrin</b></li> <li>5. Forensic Light</li> <li>6. Zinc Chloride/Physical Developer</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Blood Enhancement Raw Wood Surface</p> <p><b>OTHER CHEMICAL NAME(S):</b> Triketohydrindene Hydrate 2,2-dihydroxy-1,3-indanedione 2,2-dihydroxy-1H-indene-1,3(2H)-dione 1,2,3-indanetrione monohydrate</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Twelve (12) months</p>
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### **Process Summary:**

Ninhydrin is an amino acid developing reagent that is applied by dipping, brushing or spraying.

Development is catalyzed by the addition of steam and heat through the use of a humidity chamber.

Ninhydrin may be used as a blood enhancement technique.

### **Accepted Deviations:**

Several alcohols may be used as the carrier solvent. A solvent called "3M Novec Engineering Fluid

HFE7300" is promoted as a solvent which reduces background staining. Methods such as Zinc chloride





may be used to fluoresce the ninhydrin developed detail.

### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
5. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## PHYSICAL DEVELOPER

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Black</b>		 HARMFUL/IRRITANT		<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
Maleic acid pre-wash:		Commercial Working Solution:		
50 grams Maleic acid powder dissolved in 2 liters of distilled water.		1 part solution A (5ml. /10ml. /15ml.) to 18 parts solution B (90ml./180ml./270ml.)		
PROCEDURE OF APPLICATION				
1. Pre-wash (10 minutes)  2. Working solution (20 minutes)  3. Rinse (5 minutes)  4. Rinse (5 minutes)				
DEVELOPMENT COMPLETE WHEN				
A background staining of item becomes apparent.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Glassware <b>MUST</b> be absolutely clean.  Creases and damage to the item causes the solution to develop their appearance.  Cyanoacrylate is detrimental to this process.	Items that disintegrate in water solutions.  Thermal fax papers, blueprints and photostats with an alkalinity factor above pH 7 will become completely stained.  Items that cannot be effectively rinsed of the working solution.  Items to be submitted for Questioned Document Examination.	The working solution <b>MUST</b> be mixed in the order listed!!  Be sure to agitate the working solutions to optimize development.  Processing should be done away from direct sunlight. Use clean GLASS labware.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
<p>Working solution is made fresh with each application.</p> <p>The Silver nitrate solution is stored in a dark stoppered container.</p>	<p>Avoid getting solution stains on your skin and clothing.</p>	<p>Use a rocker platform (orbital shaker) to keep the working solution in suspension.</p> <p>Use non-metal tongs and forceps to handle items.</p> <p>P.D. is used as a post-D.F.O. and post-Ninhydrin process, and is used especially on currency.</p>
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Small Particle Reagent</li> <li>• Sudan Black</li> </ul>		<ul style="list-style-type: none"> <li>• Sodium Hypochlorite</li> </ul>

<p><b>CHEMICAL NAME:</b> Physical Developer</p> <p><b>SURFACE USED ON:</b> Porous Surfaces, especially currency &amp; paper. Effective on wet items</p> <p><b>SENSITIVE TO:</b> Sebaceous Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. D.F.O.</li> <li>4. Ninhydrin</li> <li>5. <b>Physical Developer</b></li> <li>6. Sodium Hypochlorite</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Post Ninhydrin Raw Wood Surfaces Wet Surfaces</p> <p><b>OTHER CHEMICAL NAME(S):</b> P.D.</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Prepared as needed</p>
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### Process Summary:

This is a multi-solution, multi-step process that can be used as a follow-up to ninhydrin cases. This is the technique of choice for paper currency items, and porous items that may have been wet.



### **Accepted Deviations:**

Commercial or Laboratory-prepared mixtures are used. Physical Developer also develops indentations in paper surfaces; therefore FW/TT impressions may be enhanced.








### **Supporting Reference Materials:**

1. Technical Note No. 1-2730 "Physical Developer Kit", Lightning Powder Co., Inc. (1990)
2. "Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
3. Navarro, R.L., "Chemical Enhancement of Questioned Footwear Impressions", North Carolina State Bureau of Inv., 1992.
4. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
5. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
6. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.





## R.A.M.

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Orange Fluorescence	 	 		

FORMULA		
1. Rhodamine 6G Stock Solution:	2. M.B.D. Stock Solution:	3. R.A.M. Working Solution:
1 g Rhodamine 6G dissolved in 1 liter Methanol	1 g M.B.D. dissolved in 1 liter Acetone	(Combine in the order listed) 3 ml Rhodamine Stock Solution 2 ml Ardrex P133D 7 ml M.B.D. stock Solution 20 ml Methanol 10 ml Isopropanol 8 ml Acetonitrile 950 ml Petroleum ether
PROCEDURE OF APPLICATION		
1. Spray, dip, or use a squirt bottle to apply R.A.M. to the item. 2. Examination under a laser or Forensic Light Source at 415 nm to 530 nm. Absorption Max is 460 nm. Use orange colored goggles. 3. Photograph results using orange barrier filter.		
DEVELOPMENT COMPLETE WHEN		
The cyanoacrylate has absorbed the dye stain.		
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the 555 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.  'Pooling' may result if the item is immersed into a solution of the dye-stain.



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass or plastic bottles.	Fume hood use is required when preparing and applying this reagent.	<p>The recommended procedure of application is the wash bottle method.</p> <p>Allow the cyanoacrylate treated item to sit overnight prior to dye staining.</p> <p>A rinse using Petroleum ether may be necessary to avoid excessive staining by the dye.</p>
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• M.B.D.</li> <li>• Nile Red</li> <li>• R.A.Y.</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> <li>• Thenoyl Europium Chelate</li> </ul>		<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• M.R.M. 10</li> <li>• R.A.Y.</li> </ul>

<p><b>CHEMICAL NAME:</b> R.A.M.</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. <b>R.A.M.</b></li> <li>5. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> One (1) month</p>
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**Process Summary:**

A mixture of fluorescent dye-stains used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light between 415 nm and 530 nm is required for this process.

**Accepted Deviations:**






The excitation wavelength may be varied to determine which produces the best fluorescence.

**Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Lennard, C.J. & Margot, P.A., "Sequencing of Reagents for the Improved Visualization of Latent Fingerprints", Jor. Forensic Identification, Vol. 38, No. 5, pp. 197-210, Sept./Oct. 1988



## R.A.Y.

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Orange Fluorescence	 Orange or Red Filter	 HARMFUL/IRRITANT		
FORMULA				
R.A.Y. Working Solution (Combine in the order listed):				
1. 0.5 g Basic Yellow 40 dye 2. 10 ml Glacial acetic acid 3. 0.05 g Rhodamine 6 dye 4. 4 ml Ardrex P133D 5. 450 ml Isopropanol - or - denatured Ethanol 6. 40 ml Acetonitrile				
PROCEDURE OF APPLICATION				
1. Spray, dip, or use a squirt bottle to apply R.A.Y. 2. Examination under a laser or Forensic Light Source at 450 nm to 550 nm. Use orange or red colored goggles. 3. Photograph results using orange or red barrier filter.				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the 490 nm to 555 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark stoppered glass or plastic bottles.	Use Ultra-violet protection goggles when working with long-wavelength ultra violet light sources.  Fume hood use is required when preparing and applying the reagent.	The recommended procedure of application is to immerse the item in a tray of the dye.  A rinse using alcohol may be necessary to avoid excessive staining by the dye.		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• M.B.D.</li> <li>• M.R.M. 10</li> <li>• Nile Red</li> <li>• R.A.Y.</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> <li>• Thenoyl Europium Chelate</li> </ul>	<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• M.R.M. 10</li> <li>• R.A.M.</li> </ul>

<p><b>CHEMICAL NAME:</b> R.A.Y.</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. Rhodamine 6G</li> <li>5. Forensic Light</li> <li>6. R.A.Y.</li> <li>7. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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### Process Summary:

A mixture of fluorescent dye-stains used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light between 365 nm and 550 nm is required for this process.

### Accepted Deviations:








The excitation wavelength may be varied to determine which produces the best fluorescence.

### Supporting Reference Materials:

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.5.



## RHODAMINE 6G

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Orange Fluorescence	  Orange Filter	  HARMFUL/IRRITANT		
FORMULA				
Rhodamine 6G Stock Solution:		Rhodamine 6G Working Solution:		
1 g Rhodamine 6G dissolved in 1 liter Methanol		(Combine in the order listed) 3 ml Rhodamine Stock Solution 15 ml Acetone 10 ml Acetonitrile 15 ml Methanol 32 ml Isopropanol 925 ml Petroleum ether		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Spray, dip, or use a squirt bottle to apply the Rhodamine solution to the item.</li> <li>2. Examination under a laser or Forensic Light Source at 495 nm to 540 nm. Absorption Max is at 525 nm. Use orange or red colored goggles.</li> <li>3. Allow the item to air dry.</li> <li>4. Photograph results using an orange or bandpass 550(BP35) barrier filter.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the 555 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass or plastic bottles.	Fume hood use is required when preparing and applying this reagent.	<p>The recommended procedure of application is to immerse the item in a tray of the dye.</p> <p>A rinse using alcohol may be necessary to avoid excessive staining by the dye.</p>
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• M.B.D.</li> <li>• Nile Red</li> <li>• R.A.Y.</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> <li>• Thenoyl Europium Chelate</li> </ul>		<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• M.R.M. 10</li> <li>• R.A.M.</li> <li>• R.A.Y.</li> </ul>

<p><b>CHEMICAL NAME:</b> Rhodamine 6G</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. <b>Rhodamine 6G</b></li> <li>5. Forensic Light</li> <li>6. R.A.M.</li> <li>7. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b></p> <ol style="list-style-type: none"> <li>1. 9-(2-ethoxycarbonyl)phenyl)-3,6bis(ethyl amino)-2,7-dimethylxanthylium chloride</li> <li>2. Basic red 1</li> </ol> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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**Process Summary:**

A fluorescent dye-stain used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light between 495 nm and 530 nm is required for this process.

**Accepted Deviations:**

The strength (i.e. concentration) of the dye stain may be adjusted to personal preferences. The excitation wavelength may be varied to determine which produces the best fluorescence.







**Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.





## SAFRANIN O

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence		  HARMFUL/IRRITANT		
FORMULA				
1. 1 g Safranin O powder 2. 1000 ml Methanol 3. Combine the above and stir using a magnetic stirring device.				
PROCEDURE OF APPLICATION				
1. Spray, immerse, or use a squirt bottle to apply the Safranin O solution to the item. 2. Allow the item to air dry. 3. Examination under a laser or Forensic Light Source around the 500 nm region. Use orange colored goggles. 4. Photograph results using an orange or bandpass 550(BP35) barrier filter.				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce around the 500 nm range will interfere with the dye stain fluorescence.	Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark or Clear stoppered glass or plastic bottles.	Fume hood use is required when preparing and applying the reagent.	This dye-stain is effective at the low 500 nm region of forensic light source illumination.		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• M.B.D.</li> <li>• Nile Red</li> <li>• Rhodamine 6G</li> <li>• Thenoyl Europium Chelate</li> </ul>	<p><u>Not Necessarily in this Order:</u></p> <ul style="list-style-type: none"> <li>• M.R.M. 10</li> <li>• R.A.M.</li> <li>• R.A.Y.</li> </ul>

<p><b>CHEMICAL NAME:</b> Safranin O</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. <b>Safranin O</b></li> <li>5. Forensic Light</li> <li>6. R.A.M.</li> <li>7. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> Basic Red 2 Brilliant safranin BR Brilliant Safranin G Calcozine red Y Safrin T Leather red HT</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>
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### Process Summary:

A fluorescent dye-stain used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light around 500 nm is required for this process.

### Accepted Deviations:

A rinse of methanol may be used to remove excess dye stain from the item. A heat gun may be used to dry the item before viewing with a Forensic Light Source.







### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.



## SILVER NITRATE

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Brown</b>		 HARMFUL/IRRITANT		<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
Formula "A" (1.0% Solution):	Formula "B" (3.0% Solution):	Formula "C" (Alcohol-based solution)		
• 1 g of Silver Nitrate	• 30 g of Silver Nitrate	• 30 g of Silver Nitrate		
• 100 ml of distilled water	• 1000 ml of distilled water	• 100 ml of distilled water • 1000 ml of Ethanol		
PROCEDURE OF APPLICATION				
1. a) Tray immersion of item for 5 seconds. b) Reagent solution brushed onto item until coated.  2. Air dry for 20 minutes.  3. Sunlight or U.V. light exposure at 366 nm for ten to sixty minutes. Continuously monitor for development.				
DEVELOPMENT COMPLETE WHEN				
Discontinue the processing before any dark-brown background staining begins to cause the developed detail to lose contrast.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Wet surfaces may have had their chloride components dissolved away.  Silver Nitrate is a non-specific chloride developer.	Items which have been wet may be leached of their chloride and salt impressions.  Surfaces that have high chloride or salt compounds coating their surfaces or imbedded in them will produce unacceptable background staining.	High background staining may occur rapidly once the evidence is subjected to sunlight.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass bottles.	Use U.V. blocking eyewear when developing detail under U.V. light.  Do not allow the reagent to contact your skin.	Be sure to have the photographic set-up standing by once you begin the development process, else overdevelopment may occur before you have a chance to photograph the developed detail.
SEQUENTIAL REAGENTS		
<ul style="list-style-type: none"> <li>• Ultra-Violet Light</li> </ul>		

<p><b>CHEMICAL NAME:</b> Silver Nitrate</p> <p><b>SURFACE USED ON:</b> Porous Surfaces (Wood) that have not been wet</p> <p><b>SENSITIVE TO:</b> Chloride &amp; Salt Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Ninhydrin</li> <li>4. Silver Nitrate</li> <li>5. Ultra-Violet Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Ultra-Violet Light induced</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Twelve (12) months</p>
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### Process Summary:

This process works by having sunlight develop the impression detail treated with the working solution. Background staining is a problem; thus, the technique is not in wide use. The technique has its successes when used on wood surfaces that have *not* been treated with wax or varnish finishes.

### Accepted Deviations:

The concentration of the reagent may be increased up to 5%. Ultraviolet light can be used instead of sunlight to develop the detail. The working solution may be applied by spraying, dipping or brushing.







### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Cowger, J.R. (1983), "Friction Ridge Skin", Elsevier, Page 99.
4. Olsen, R.D. (1978), "Scott's Fingerprint Mechanics", Charles C. Thomas, Pg. 291.
5. Keedwell, E., et. al. (1988), "Chemical Methods for Enhancement of Footwear Marks", Metropolitan Police Forensic Science Lab., Report No. 73, page 19.
6. Cassidy, M.J., Footwear Identification, Lightning Powder Co., Salem, Oregon, pg.59, 1995.



## SMALL PARTICLE REAGENT

Development	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
<b>Color:</b> Dark Grey 		 HARMFUL/IRRITANT		<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
Solution #1:	Solution #2:	Solution #3:		
4 g Choline chloride 8 ml Tergitol 7 500ml distilled water & Stir	10 g molybdenum disulfide 50 ml of solution #1 & Stir	Add 900 ml distilled water to solution #2 & Stir. -- or -- (Combine the following into a suspension:) 0.4 ml Tergitol (detergent) 5 g Molybdenum disulfide 50 ml distilled water		
PROCEDURE OF APPLICATION				
1. a) Tray immersion - keep stationary for 1 minute. - or - b) Squeegee bottle application - Shake well and apply. Repeat for 1 minute.  2. a) Tray rinse excess reagent in tap water for 15 seconds. - or - b) Tap water rinse under running water for 15 seconds.  3. Allow the item to dry at room temperature. 4. Photograph any developed detail, then you may try lifting the dried print.				
DEVELOPMENT COMPLETE WHEN				
Repeated applications no longer produce ridge detail development or enhancement.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Keep agitating the S.P.R. solution when applied as a spray technique. Do NOT agitate the S.P.R. reagent when applied as a tray immersion technique.  S.P.R. is less effective on items that have dried after being wet.	Porous surfaces and items that disintegrate in water solutions.  Items that cannot be effectively rinsed of the working solution.	Check with Questioned Document Unit before processing items bearing written material.  This procedure is messy.  The dried reagent is difficult to wash or remove.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Dark stoppered glass or plastic bottles.	No real health problems, although it is wise to wear safety goggles during processing and to avoid prolonged skin contact with the reagent.	<p>Recommended in wet conditions of falling rain or snow.</p> <p>This reagent can effectively work on items which have been soaked in liquid accelerants.</p> <p>Completely immersing the item in a tray of the reagent is more effective than squirt or spray applications.</p>
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Physical Developer</li> <li>• Sudan Black</li> </ul>		<ul style="list-style-type: none"> <li>• Physical Developer</li> </ul>

<p><b>CHEMICAL NAME:</b> Small Particle Reagent</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces Effective for use on wet items</p> <p><b>SENSITIVE TO:</b> Sebaceous lipids &amp; Fatty Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Sudan Black</li> <li>4. <b>Small Particle Reagent</b></li> <li>5. Forensic Light</li> <li>6. Physical Developer</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Post Cyanoacrylate Wet Surfaces</p> <p><b>OTHER CHEMICAL NAME(S):</b> S.P.R. Molybdenum disulfide Molybdenum disulphide</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>
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### Process Summary:

A reagent for latent print processing of items which are wet when recovered. Suggested for use on items where latent print powders are ineffective. This reagent can effectively work on items which have been





soaked in liquid accelerants. The active ingredient (Molybdenum disulfide), which is applied either by spray or dipping. This technique requires a large work area that will be subject to messy conditions.

### **Accepted Deviations:**




S.P.R. can be used as a post-cyanoacrylate process when dye stains are ineffective. Commercial kits are available, which can develop ridge detail in black, white or Ultra-violet. Application of the reagent may be repeated to enhance any faintly-developed ridge detail. The developed ridge detail may be lifted after being photographed.

### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. Navarro, R.L., "Chemical Enhancement of Questioned Footwear Impressions", N.C. Bureau of Investigation, 1992, Page 53.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
5. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.
6. Almog, Frank A., "Modified SPR for Latent Fingerprint Development on Wet, Dark Objects", Jor. Forensic Ident., Vol. 43, No. 3, 1993, pp.



## STICKY SIDE POWDER

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
GRAY				<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
<ol style="list-style-type: none"> <li>Place 1 teaspoon of powder in a shallow jar or mixing bowl.</li> <li>Equal parts of Photo-Flow and water are mixed with the powder to form a THIN paste.</li> </ol>				
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>Brush this mixture with a camel hairbrush onto the tape's adhesive surface.</li> <li>Wait 30 to 60 seconds.</li> <li>Rinse under a gentle stream of cold tap water.</li> <li>Allow tape to air dry.</li> <li>Photograph any developed ridge detail.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
Dark-gray latent prints are revealed after a gentle tap water rinse.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Poor results are generally obtained on black electrical tapes, some paper labels, and tapes bearing dried out adhesives.	Some tapes and adhesive labels absorb the paste too readily and cannot be rinsed of excess paste.	Do not leave the paste on the tape surface for too long, since it may be difficult to rinse off.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark or Clear stoppered glass or plastic bottles.	Safe!	An alternative application method is to immerse tapes into a bowl containing the reagent.		
SIMILAR REAGENT		SEQUENTIAL REAGENTS		
<ul style="list-style-type: none"> <li>Gentian Violet</li> <li>Liqui-Drox</li> <li>Liqui-Nox</li> <li>Physical Developer</li> </ul>		Not Necessarily in this Order: <ul style="list-style-type: none"> <li>Liqui-Drox</li> </ul>		



<p><b>CHEMICAL NAME:</b> Sticky Side Powder</p> <p><b>SURFACE USED ON:</b> Tape Surfaces</p> <p><b>SENSITIVE TO:</b> Sebaceous &amp; Lipid Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"><li>1. Visual Examination</li><li>2. Forensic Light</li><li>3. Gentian Violet</li><li>4. <b>Sticky Side Powder</b></li><li>5. Forensic Light</li></ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous surfaces Post Cyanoacrylate Tape Surfaces</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Prepared as needed</p>
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### Process Summary:

The reagent is prepared as a paste, then is brushed unto the adhesive sides of tape surfaces. This reagent is considered to be a more economical alternative to other adhesive-tape processing methods. Cyanoacrylate fuming does not inhibit the use of this reagent.

### Accepted Deviations:






Commercial kits are available for use. The reagent may be mixed vigorously to create a foam solution. The reagent may be repeatedly applied, if necessary, to improve the detail.

### Supporting Reference Materials:

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
4. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
5. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## SUDAN BLACK

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 <b>Deep Blue</b>				
<b>FORMULA</b>				
15 g Sudan black powder dissolved in 1000 ml Ethanol add, then stir with 500 ml distilled water				
<b>PROCEDURE OF APPLICATION</b>				
<ol style="list-style-type: none"> <li>1. Immerse in Working solution for 2 minutes.</li> <li>2. Cold Tap water rinse - remove excess dye.</li> <li>3. Dry item at room temperature.</li> </ol>				
<b>DEVELOPMENT COMPLETE WHEN</b>				
Dark blue-stained ridge detail is revealed upon a tap water rinse and the item allowed to air-dry.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
<p>This reagent is considered to be a low-sensitive technique for 'natural' latent print ridge detail.</p> <p>Some source of contaminant such as grease or other dried residue is required as a target to which this reagent can bind.</p>	<p>Porous items which absorb the reagent, and dark colored items.</p>	<p>This is considered to be a messy technique.</p>		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
<p>Dark or Clear stoppered glass bottles.</p>	<p>No known health hazards.</p> <p>Use in a well-ventilated area.</p>	<p>Useful for those wetted items whose surfaces are contaminated with substances such as grease, beverages and food-stuffs.</p> <p>Useful for post-cyanoacrylate staining on the inside of latex gloves.</p>		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Physical Developer</li> <li>• Small Particle Reagent</li> </ul>	<ul style="list-style-type: none"> <li>• Physical Developer</li> <li>• Small Particle Reagent</li> </ul>

<p><b>CHEMICAL NAME:</b> Sudan Black</p> <p><b>SURFACE USED ON:</b> Wet, Non-Porous &amp; Grease-Contaminated Surfaces</p> <p><b>SENSITIVE TO:</b> Sebaceous Components</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. <b>Sudan Black</b></li> <li>4. Forensic Light</li> <li>5. Physical Developer</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Visible chemical/stain reaction</p> <p><b>REAGENT APPLICABILITIES:</b> Residue-contaminated items Water-soaked items Non-Porous surfaces Post-Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> Solvent black 3 SSB</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Indefinite</p>
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### Process Summary:

A dye stain technique for use on wet items, it is considered less sensitive than other wet item techniques in use. Sudan black is considered useful for those wet items whose surfaces are contaminated with substances such as grease, beverages and food-stuffs.

### Accepted Deviations:

May be used as a post-cyanoacrylate developer, and is especially useful for post-cyanoacrylate staining on the inside of latex gloves.

### Supporting Reference Materials:









1. Stone, R.S., & Metzger, R.A., "Comparison of Development Techniques for Water Soaked Porous Items-Sudan Black Solution / Magna Powder", Identification News, Jan 1981, pp. 13.
2. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
3. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.



4. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
5. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
6. Technical Notes, Lightning Powder Co. Inc., Salem, OR., 2001.



## THENOYL EUROPIUM CHELATE

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Yellow Fluorescence	  Red Filter	  NOTICE EYE DAMAGE MAY OCCUR DO NOT VIEW PROCESS WITHOUT SHADES IN PLACE	  UV Eye Protection	
FORMULA				
Stock Solution A:	Stock Solution B:	Thenoyl Europium Chelate Working Solution:		
1 g Thenoyltrifluoroacetone dissolved in 200 ml of Methyl ethyl ketone.	0.5 g Europium chloride hexahydrate dissolved in 800 ml of distilled water.	(Combine in the order listed) Combine: Stock solution A & B. Mix: 100 ml Combined stock solutions 180 ml Methyl ethyl ketone 720 ml distilled water.		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Immerse or use a squirt bottle to apply the reagent for about two minutes.</li> <li>2. Allow the item to air dry.</li> <li>3. Examination under a laser or Forensic Light Source at the long-wave ultra-violet region around 350 nm. View using ultra-violet protection goggles.</li> <li>4. Photograph results using a red colored or 600(BP 35) bandpass filter.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
The cyanoacrylate has absorbed the dye stain.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Surfaces that absorb too much dye stain will fluoresce too brilliantly to be effective for photography.	Items that inherently fluoresce in the ultra-violet region will interfere with the dye stain fluorescence.	<p>Secure the storage bottles tightly to prevent solution loss due to evaporation.</p> <p>Avoid excess build-up of cyanoacrylate, since this may result in ridge detail depicting little contrast to the strongly fluorescent surface.</p>		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Tightly-stoppered dark glass or plastic bottles.	Use ultra-violet light eyewear protection.  Fume hood use is required when preparing and applying this reagent.	The recommended procedure of application is to immerse the item in a tray of the dye.  If applying via squirt bottle, keep applying the reagent until maximum contrast is viewed under Ultra-violet light.
SIMILAR REAGENT		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Ardrox</li> <li>• Basic Yellow 40</li> <li>• Basic Red 28</li> <li>• Liqui-Drox</li> <li>• M.B.D.</li> <li>• Nile Red</li> <li>• Rhodamine 6G</li> <li>• Safranin O</li> </ul>		<u>Not Necessarily in this Order:</u> <ul style="list-style-type: none"> <li>• M.B.D.</li> <li>• M.R.M. 10</li> <li>• R.A.M.</li> <li>• R.A.Y.</li> </ul>

<p><b>CHEMICAL NAME:</b> Thenoyl Europium Chelate</p> <p><b>SURFACE USED ON:</b> Non-Porous Surfaces</p> <p><b>SENSITIVE TO:</b> Cyanoacrylate deposit</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"> <li>1. Visual Examination</li> <li>2. Forensic Light</li> <li>3. Cyanoacrylate Fuming</li> <li>4. T.E.C.</li> <li>5. Ultra-Violet Ramp</li> <li>6. R.A.Y.</li> <li>7. Forensic Light</li> </ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Ultra-Violet Light induced</p> <p><b>REAGENT APPLICABILITIES:</b> Non-Porous Surfaces Fluorescent Technique Post Cyanoacrylate</p> <p><b>OTHER CHEMICAL NAME(S):</b> Europic chloride</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Three (3) months</p>
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### **Process Summary:**

A fluorescent dye-stain used to enhance cyanoacrylate-developed latent prints. A fluorescent light source that will output light in the long-wave ultra-violet region (around 350 nm) is required for this process. T.E.C. reportedly produces a brighter fluorescence of ridge detail with less interfering background luminescence than other dye stains such as Rhodamine 6G and Ardrex.

### **Accepted Deviations:**

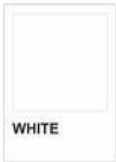




Immerse or use a squirt bottle to apply the reagent solution to the cyanoacrylate-fumed item. A rinse of 800 ml methanol and 200 ml distilled water can be used to remove excess dye-stain from the item.

### **Supporting Reference Materials:**

1. Minutiae Magazine, Summer Special 1994, Issue No. 24, pg.7.
2. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
3. Wilkinson, D., and Misner, A., "A Comparison of Thenoyl Europium Chleate with Ardrex and Rhodamine 6G for the Fluorescent Detection of Cyanoacrylate Prints", Jor. Forensic Identification, Vol. 44, No. 4, July/Aug 1994, pp. 387-406.



## ULTRA-VIOLET LIGHT

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
				
FORMULA				
Used for:		Centered Wavelengths:		
<p>A. Fluorescing fingerprint powders.</p> <p>B. U-V sensitive dye stains.</p> <p>C. Skin tissue examination.</p> <p>D. Darkens blood impressions.</p> <p>E. Fluorescing fluids for refrigerants, transmissions, fuels and coolants.</p> <p>F. Luminesces backgrounds for contrast improvement.</p>		<p>1. SHORT - WAVE: 180 nm - 280 nm viewing. Oily, sweaty &amp; contaminated ridge detail viewing. Luminol excitation.</p> <p>2. MEDUIM - WAVE: 280 nm to 320 nm viewing. Bruises, Bite marks, &amp; Wounds viewing.</p> <p>3. LONG - WAVE: 320 nm to 400 nm viewing. Used for excitation of dye stains Ardrex, Basic Yellow 40 &amp; T.E.C. Fluoresces many natural and man-made substances.</p>		
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Wear UV-absorbing protective eyewear.</li> <li>2. Reduce ambient light.</li> <li>3. Aim the U-V light.</li> <li>4. Photograph detail using yellow or 2-A haze barrier filters.</li> </ol>				
DEVELOPMENT COMPLETE WHEN				
the item's surfaces have been examined.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Handing items (by handles) in their normal manner may obliterate or smudge visible detail.	Items that inherently luminesce in the ultra-violet region may interfere with dye stain contrast.	Ascertain that items do not have liquid or loose components that may spill if the item is subjected to maneuvering.		



STORAGE CONTAINER	SAFETY	RECOMMENDATIONS
Not applicable.	Ultra-violet light absorbing protective eyewear must be worn.  Short wavelength Ultra-violet light (180 nm - 280 nm) can cause severe burns to eyes and skin.	Adjusting the wavelength (short, medium, or long wavelength) may produce better visualization results.
SIMILAR REAGENTS		SEQUENTIAL REAGENTS
<ul style="list-style-type: none"> <li>• Fluorescent Light</li> <li>• Visual Examination</li> </ul>		<u>Not Necessarily in this Order:</u> <ul style="list-style-type: none"> <li>• Iodine Fuming</li> <li>• Electrostatic Lifting</li> <li>• Fluorescent Light</li> <li>• Visual Examination</li> </ul>
<p><b>CHEMICAL NAME:</b> Ultra-Violet Light</p> <p><b>SURFACE USED ON:</b> Non-Destructive for all surfaces</p> <p><b>SENSITIVE TO:</b> Absorption of UV Radiation</p>		<p><b>RIDGE DETAIL VISUALIZED BY:</b> Ultra-Violet Light induced</p> <p><b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces Non-Destructive</p> <p><b>OTHER CHEMICAL NAME(S):</b> U.V. light "Black Light" "Sun Lamp" Far Ultra-violet Near Ultra-violet Middle Ultra-violet UV-A UV-B UV-C</p>

**Process Summary:**

A non-destructive technique to note the presence of visible detail. Several models of ultra-violet light sources are available that produce short-wave and long-wave (or both) lights. Detail is visualized either by turning darker upon absorbing ultra-violet light or by luminescing upon emitting ultra-violet light. Yellow or ultra-violet light blocking filters are used during photography of the detail.



### **Accepted Deviations:**





Adjusting the wavelength of the ultra-violet light source may produce better visualization results.

### **Supporting Reference Materials:**

1. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
2. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.



## VISUAL EXAMINATION

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
				<b>YES</b> <input type="checkbox"/> <b>NO</b> <input checked="" type="checkbox"/>
FORMULA				
Not Applicable				
PROCEDURE OF APPLICATION				
A. Simple ambient light. B. Absorbed light (filter out background color). C. Reflected light. (for greasy impressions). D. Oblique light (for dust impressions). E. Transmitted light (on transparent surfaces). F. Directed light (to subdue surface texture).				
DEVELOPMENT COMPLETE WHEN				
The item's surfaces have been examined.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Handing items (by handles) in their normal manner may obliterate or smudge visible detail.	Not applicable.	Ascertain that items do not have liquid or loose components that may spill if the item is subjected to maneuvering.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Not applicable.	Beware of sharp corners and pointed items, or, contents that may spill.	Adjusting the source, angle, and illumination intensity may produce better visualization results.		
SIMILAR REAGENTS		SEQUENTIAL REAGENTS		
<ul style="list-style-type: none"> <li>• Fluorescent Light</li> <li>• Ultra-Violet Light</li> </ul>		<u>Not Necessarily in this Order:</u> <ul style="list-style-type: none"> <li>• Iodine Fuming</li> <li>• Electrostatic Lifting</li> <li>• Fluorescent Light</li> <li>• Ultra-Violet Light</li> </ul>		



<b>CHEMICAL NAME:</b> Visual Examination	<b>RIDGE DETAIL VISUALIZED BY:</b> Visible Stain
<b>SURFACE USED ON:</b> Non-Destructive for all surfaces	<b>REAGENT APPLICABILITIES:</b> Porous Surfaces Non-Porous Surfaces
<b>SENSITIVE TO:</b> Reflected & Absorbed Lighting	<b>OTHER CHEMICAL NAME(S):</b> Ambient light Natural light Absorbed light Reflected light Directed light Oblique light Transmitted light

### Process Summary:

A non-destructive technique to note the presence of visible detail. Several natural and artificial sources, and angles of light may be utilized in order to best visualize any detail that is present.

### Accepted Deviations:

Adjusting the source, angle, and illumination intensity may produce better visualization results.









Numerous lamps, colored filters, fiber optic guides, liquid light guides and forensic light sources can be utilized.

### Supporting Reference Materials:

1. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.
2. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.



## ZINC CHLORIDE

Development Color:	Method to Record:	Hazard:	Protective Clothing:	Fume Hood Use:
 Orange Fluorescence	  Orange or Red Filter	  VERY TOXIC	 	
FORMULA				
30 g Zinc chloride dissolved in 500 ml methyl-tert-butylether (MTBE) 20 ml of anhydrous Ethanol.				
Use magnetic stirrer until completely dissolved. Dissolution may be slow. Add 10 ml Glacial acetic acid. Dilute with 500 ml Petroleum ether.				
PROCEDURE OF APPLICATION				
<ol style="list-style-type: none"> <li>1. Spray the item lightly.</li> <li>2. Air-dry the item.</li> <li>3. Process &amp; dry a second time.</li> <li>4. Oven bake at 80 - 100 degrees C at 65% humidity for 20 minutes.</li> </ol> <ul style="list-style-type: none"> <li>• Ninhydrin &amp; 5-MTN Treated Items: View under a forensic light source 450 nm to 530 nm. Use dark orange or red barrier filters. Photograph results using an orange colored or 550(BP 35) bandpass filter.</li> <li>• 1,2-Indanedione Treated Items: For most papers ..... View @ 515 nm with orange barrier filter. For manila, brown paper bags, cardboard items &amp; kraft paper .... View @ 515 - 570 nm with orange or red 600(BP 35) barrier filters.</li> </ul>				
DEVELOPMENT COMPLETE WHEN				
The Ruhemann's purple color is shifted to an orange color.				
SOURCE OF ERROR	INCOMPATIBILITIES	PRECAUTIONS		
Areas deeply stained Ruhemann's purple may yield little detail.	Items that have not been treated with Ninhydrin, 1,2Indanedione, or 5-MTN.	Spray zinc chloride LIGHTLY onto the item. Avoid visibly wetting the surface with the reagent solution.		
STORAGE CONTAINER	SAFETY	RECOMMENDATIONS		
Dark stoppered glass bottles.	Zinc chloride is considered toxic and corrosive.  Prepare and apply in a fume hood.	Use a fine-mist aerosol sprayer to apply the reagent solution.  Use a forensic light source to induce fluorescence of the zinc chloride.		



SIMILAR REAGENT	SEQUENTIAL REAGENTS
<ul style="list-style-type: none"><li>Nickel Nitrate</li></ul>	<ul style="list-style-type: none"><li>Physical Developer</li><li>Sodium Hydrochlorite</li><li>Silver Nitrate</li></ul>

<p><b>CHEMICAL NAME:</b> Zinc Chloride</p> <p><b>SURFACE USED ON:</b> Porous surfaces</p> <p><b>SENSITIVE TO:</b> Ninhydrin, 5-MTN &amp; 1,2-Indanedione Compounds</p> <p><b>ABRIDGED REAGENT SEQUENCE:</b></p> <ol style="list-style-type: none"><li>Visual Examination</li><li>Forensic Light</li><li>D.F.O.</li><li>Ninhydrin / 1,2-Indanedione</li><li>Zinc-Chloride</li><li>Forensic Light</li></ol>	<p><b>RIDGE DETAIL VISUALIZED BY:</b> Forensic Light Source induced</p> <p><b>REAGENT APPLICABILITIES:</b> Porous surfaces Fluorescent technique Post-Ninhydrin</p> <p><b>OTHER CHEMICAL NAME(S):</b> None</p> <p><b>WORKING SOLUTION SHELF-LIFE:</b> Six (6) months</p>
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### Process Summary:

Zinc chloride is applied as post-ninhydrin, post 1,2-Indandione & post 5-MTN treatments in order to improve the strength of the fluorescence of the ridge detail for viewing and photography. When viewing the enhanced ridge detail, two approaches may be utilized ... 1). the Zinc chloride color-shifted ridge detail may be darkened with the appropriate wavelength and viewed without any barrier color filter, or, 2). the appropriate wavelength may illumine the latent print, which is viewed with the appropriate barrier color filter.

Zinc chloride treated ninhydrin ridge detail is color-shifted to an orange color, and Zinc chloride treated 5-MTN ridge detail is color-shifted to a reddish-purple color.





### **Accepted Deviations:**

Other hydrocarbon solvents such as Pentane and Heptane may be substituted for Petroleum ether. The Zinc chloride treated item may also be viewed under white light using a blue or a green filter, which should darken the light pink or orange colored ridge detail.

### **Supporting Reference Materials:**

1. "Chemical Formulas and Processing Guide for Developing Latent Prints", U.S. Dept. of Justice, pg. 47-48, 1994.
2. Manual of Fingerprint Development Techniques 2nd. Ed., Home Office - Police Scientific Development Branch, White Crescent Press, Ltd., Luton, England, 2001.
3. Advances in Fingerprint Technology 2nd. Ed., Lee, H.C. & Gaensslen, R.E., CRC Press, Boca Raton, FL., 2001.