Technical Procedure for 1,2-indanedione

1.0 Purpose - This procedure outlines how to make the 1,2-indanedione solution and apply it to items of evidence.

2.0 Scope - This procedure applies to porous items of evidence that are to be examined for the presence of latent prints. 1,2-indanedione reacts with amino acids present in fingerprint residue and produces fluorescent impressions when the reaction is complete.

3.0 Definitions – N/A

4.0 Equipment, Materials and Reagents (Alternatively Pre-mixed solutions may be purchased from a commercial Forensic Supplier)

4.1 Equipment and Materials

- Laboratory coat and gloves
- Face shield visor and/or safety goggles
- Magnetic stirrer, magnetic follower, and magnetic retriever
- Glass beakers
- Graduated cylinders
- Dark, shatter-proof container
- Weigh boats
- Forceps
- Fume hood
- Glass tray, paint brush, or aerosol sprayer (for application)
- Camera
- Dust or mist respirator (for application outside of fume hood)

4.2 Reagents

- 1,2-indanedione powder (0.2 g)
- Ethyl acetate (70 mL)
- HFE-7100/Heptane (930 mL)

5.0 Procedure

5.1 Chemical Preparation

5.1.1 1,2-Indanedione

5.1.1.1 Place 0.2 gram of 1, 2-indanedione powder and a magnetic follower into a 1000 mL beaker.

5.1.1.2 Add 70 mL of ethyl acetate to the beaker and stir. Do not use heat.

5.1.1.3 Add 930 mL of HFE-7100/Heptane to the solution. Continue stirring until the 1,2-indanedione powder has completely dissolved.

5.1.1.4 Transfer the resulting solution to a clean, dark, shatterproof container.

5.2 Processing Procedures

5.2.1 Chemical Application

5.2.1.1 The Examiner shall produce a self-made test print to be processed concurrently with items of evidence.

5.2.1.2 Dipping Method –Completely submerge the item in the working solution for 5 to 10 seconds.

5.2.1.3 Brush Method – Dip the brush into the working solution and brush directly onto the item.

5.2.1.4 Spray Method – Spray the item with the working solution to completely saturate the item.

5.2.1.5 Allow the item to dry completely prior to proceeding.

5.2.2 Latent impressions will develop over time at room temperature. Several methods are available to enhance the development process.

5.2.2.1 Plastic Bag – Place the item in a sealed plastic bag until latent impressions develop.

5.2.2.2 Steam Iron – The iron is used to provide heat and moisture to the item. Hold the iron above the item and steam it, taking care to avoid contact between the item and the iron.

5.2.2.3 Hot Plate Humidification – Heat a tray or beaker of water on a hot plate in order to produce steam. Place the item in enclosure for approximately 5 minutes, or until impressions develop.

5.2.2.4 Oven - Bake at 100 degrees C for 10-20 minutes at 60% relative humidity or with no added humidity.

Option Test item may be treated with Zinc Chloride to enhance developed friction ridge detail.

5.2.3 Preservation of Developed Impressions – Preserve the developed impressions through photography (see photographic equipment procedures) and/or by electronic recording (see Section Image Processing Procedure).

5.3 Standards and Controls – N/A

5.4 Calibration – N/A

5.5 Sampling – N/A

5.6 Calculations – N/A

5.7 Uncertainty of Measurement – N/A

6.0 Limitations

6.1 Latent prints treated with 1, 2-indanedione will fluoresce yellow under an alternate light source. Background fluorescence shall be considered when using this chemical.

6.2 Shelf Life -1,2-indanedione Solution - 3 months.

7.0 Safety

7.1 The process shall always be used in a fume hood as the fumes may cause some irritation when in contact with the eyes or skin and may be harmful if inhaled or ingested.

7.2 Protective goggles, gloves, and lab coats shall be worn at all times during processing.

7.3 Ethyl alcohol is extremely flammable and shall be handled properly.

8.0 References

- Almog, J., Hirshfeld, A., and Klug, J.T. **Reagents for the Chemical Development of Latent Fingerprints: Synthesis and Properties of Some Ninhydrin Analogues.** *Journal of Forensic Sciences.* Vol. 27, No. 4. 1982, pp. 912 – 917.
- Cantu, A.A., Leben, D.A., Joullie, M.M., Heffner, R.J., Hark, R.R. **A Comparative Examination of Several Amino Acid Reagents for Visualizing Amino Acid (Glycine) on paper.** *Journal of Forensic Identification*. Vol. 43, No. 1. 1993, Pgs 44 – 66.
- Cava, M.P., Litle, R.L., Napier, D.R. **Condensed Cyclobutane Aromatic Systems. V. The Synthesis of some α–diazoindanediones: Ring Contraction in the Indane Series.** *Journal of the American Chemical Society*. Vol. 80. 1958, Pgs 2257 – 2263.
- Perkin, W.H., Roberts, W.M., Robinson, R. **XXVII. 1,2-diketohydrindene.** *Journal of the Chemical Society*. Vol. 101. 1912, pp. 232 – 237.
- Ramotowski, R., Cantu, A.A., Joullie, M.M., Petrovskaia, O. **1,2-Indanediones: a Preliminary Evaluation of a New Class of Amino Acid Visualizing Compounds.** *Fingerprint World.* Vol. 23, No. 90. 1997, pp. 131 – 140.
- Hauze, D.B., Petrovskaia, O., Taylor, B., Joullie, M.M., Ramotowski, R., Cantu, A.A. **1,2-Indandiones: New Reagents for Visualizing the Amino Acid Components of Latent Prints.** *Journal of Forensic Sciences.* Vol. 43, No. 4. 1998, pp. 744 – 747.
- 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.** *Journal of Forensic Sciences.* Vol. 45, No. 4. 2000, pp. 761 – 769.
- Almog, J., Springer, E., Wiesner, S., Frank, A., Khodzhaev, O., Lidor, R., et al. **Latent Fingerprint Visualization by 1,2-indanedione and Related Compounds: Preliminary Results.** *Journal of Forensic Sciences.* Vol. 44, No. 1. 1999, pp. 114 – 118.

- Wiesner, S., Springer, E., Sasson, Y., Almog, J. **Chemical Development of Latent Fingerprints: 1,2-indanedione Has Come of Age.** *Journal of Forensic Sciences.* Vol. 46, No. 5. 2001, pp. 1082 – 1084.
- Gardner, S., Hewlett, D.F. **Optimization and Initial Evaluation of 1,2-indanedione as a Reagent for Fingerprint Detection.** *Journal of Forensic Sciences.* Vol. 48, No. 6. 2003, pp. 1288 – 1292.
- Wilkinson, D., Mackenzie, E., Leech, C., Mayowski, D. **The Results from a Canadian National Field Trial Comparing Two Formulations of 1,8-diazafluoren-9-one (DFO) with 1,2-indanedione.** *Ident Canada.* Vol. 26, No. 2. 2003, pp. 8 – 18.
- Merrick, S., Gardner, S.J., Sears, V.G., Hewlett, D.F. **An Operational Trial of Ozone-Friendly DFO and 1,2-indanedione Formulations for Latent fingerprint Detection.** *Journal of Forensic Identification.* Vol. 52, No. 5. 2002, pp. 595 – 605.
- Kasper, S.P., Minnillo, D.J., Rockhold, A.M. **Validating IND (1,2-indanedione).** *Forensic Science Communications.* Vol. 4, No. 4. 2002, http://www.fbi.gov/hq/lab/fsc/backissu/oct2002/index.htm.
- Wallace-Kunkel, C., Lennard, C., Stoilovic, M., Roux, C. **Optimisation and Evaluation of 1,2-indanedione For Use as a Fingermark Reagent and Its Application to Real Samples.** *Forensic Science International.* Vol. 168. 2007, pp. 14 – 26.
- Wilkinson, D. **Spectroscopic Study of 1,2-indanedione.** *Forensic Science International.* Vol. 114. 2000, pp. 123 – 132.

9.0 Records – N/A

10.0 Attachments – N/A

REVISION HISTORY		
CURRENT VERSION	EFFECTIVE DATE	SUMMARY OF CHANGES
1	2016/07/01	Original Version
2	2018/04/01	Change Issue to effective date, Rev. to Ver. , Changed revision history table. Under purpose change describes to outlines. Added not under enhancement to include subsequent process of Zinc Chloride.