**I. Scope:** While numerous metal salt solutions will cause a color change of ninhydrin developed latent print impressions, zinc chloride is selected when laser examination is indicated. Zinc emits a weak but observable fluorescence when illuminated with the 488 nm or 514.5nm lines from the argon-ion laser, copper vapor laser or when exposed to filtered light from a xenon arc lamp. The best results are obtained using the 488 nm line of the argon laser. Zinc chloride treated ninhydrin developed impressions when photographed with a Wratten #48 or Wratten #44 may reveal greater detail and contrast than the untreated ninhydrin impression. However, due to the damage potential of the zinc chloride application, suitable ninhydrin developed impressions should be treated only after photographic preservation and only when the possibility of increased contrast is essential.

**II. References:**

Lee, Henry, C.; Gaensslen, R. E., eds., *Advances in Fingerprint Technology*; Elsevier Science Publishers: NY, 1991.

Lennard, Christopher J.; Pierre A. Margot. “Sequencing of Reagents for the Improved Visualization of Latent Fingerprints”; *Journal of Forensic Identification,* September/October 1988, 38, 5, 197-210.

Herod, D.W.; E. Roland Menzel. “Laser Detection of Latent Fingerprints: Ninhydrin Followed by Zinc Chloride”; *Journal of Forensic Science,* 1982, 27, 513-518.

Kent, Terry, ed. *Fingerprint Development Techniques*; Heanor Gate Publisher Derbyshire, England, 1993.

Menzel, E. Roland. *Fingerprint Detection with Lasers*; Marcel Dekker: NY, 1980

Menzel, E. Roland. "A Guide to Laser Latent Fingerprint Development Procedures"; *Identification News*; September 1983.

Pounds, C.A,; R.J. Jones. “Physicochemical Techniques in the Development of Latent Fingerprints”*Trends in Analytical Chemistry,* 1983, 2, 8, 180-183.

**III. Apparatus/Reagents:**

Fume Hood

Preparations:

1. Completely dissolve 2 grams of zinc chloride in 100 milliliters of the selected solvent.

Petroleum Ether

1. Mix 5 milliliters of isopropanol with 25 milliliters of ethanol.
2. Add 5 milliliters of glacial acetic acid and mix.
3. Add 2.3 grams of zinc chloride to the solution and continue stirring until all crystals are dissolved.
4. Add 100 milliliters of dried Petroleum Ether (dry by adding 10 grams of molecular sieve for each liter of Freon 113, and allow mixture to stand for at least 24 hours.

Instrumentation:

Argon ion and copper vapor lasers as well as alternate light sources can be used to illuminate the evidence and produce the desired fluorescence. The most common wavelengths of light used are 488nm and 514.5nm, with the 488nm line being the most uniformly productive.

**IV. Safety Precautions:** This procedure involves the use of hazardous materials. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Proper caution should be exercised and the use of personal protective equipment should be utilized to avoid exposure to dangerous chemicals. Consult the appropriate MSDS for each chemical prior to use.

Proper safety precautions including avoiding skin exposure and proper eye protection with appropriate optical densities should be utilized when operating lasers or alternate light sources. Consult the appropriate users manuals for the safe use and appropriate eye protection for the specific piece of equipment being used.

All applications referenced in the procedure should be performed in a fume hood.

**V. Procedures:**

The standards and controls for using zinc chloride consist of spraying ninhydrin developed test impressions with the zinc chloride solution. Once properly exposed to the zinc chloride solution, the reaction is noted by a color change from purple ninhydrin developed impressions to a red or orange color. The test strips are then subjected to the proper level of heat and humidity. If the test prints are visualized by the proper wavelength of light the working solution can be used to process evidence.

1. Spray the ninhydrin treated surface with an extremely light spray of zinc chloride solution. Avoid visible wetting of the surface as ninhydrin impressions may be diffused by the solvent.
2. After initial exposure to the zinc chloride solution the ninhydrin impressions will change color from purple to red or orange. If the color change is not noted successive light applications of the zinc chloride solution may be required. Once the color change is noted, no additional application is needed.
3. Place the item in an environmental chamber for a few minutes. The settings should not exceed 80 degrees centigrade and 80% relative humidity.
4. Examine for fluorescence with an argon laser, copper vapor laser or other alternate light source set for the appropriate wavelengths of either 488nm or 514.5nm.
5. Photograph an observed fluorescence using the appropriate film and filters. An orange filter of the same properties as the protective eye wear is generally adequate.

**VI. Quality Assurance/Quality Control:**

Zinc chloride generally hastens the fading of ninhydrin on contact. Such fading will not normally affect fluorescence with laser or alternate light source illumination. However, luminescence is often faint and may present difficulty in the evaluation of the impression and in photographic preservation. To test solution, place test fingerprints on strips of paper. Treat the strips with ninhydrin. Continue following the procedures as listed above. If fluorescence is observed then the solution is working properly. The results of the test shall be recorded in the reagent log book.