B17 Comparison of Optimized 1,2-Indanedione-Zn and DFO for Latent Print Development

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The goal of this presentation is to introduce a combined formulation of 1,2 indanedione with zinc chloride (Ind-Zn) as an alternative to DFO as a fluorogenic reagent for latent print development.

This presentation will impact the forensic community by demonstrating how Ind-Zn can be used to replace DFO in the latent print examination protocol for dry, porous items, allowing for greater number of superior quality prints to be developed on evidence.

In latent print development, a chemical reagent and process is chosen after consideration of substrate type, background detail, and evidence condition. Fluorescent chemical processes are a newer group of reagents that have broadened the selection of tools available for latent print examiners to use when faced with the many variable states of evidence.

DFO (1,8–diazafluoren-9-one) was one of the first fluorescent chemicals used to visualize latent prints on porous materials when exposed to an alternate light source. 1,2 indanedione is a newer fluorogenic reagent that has been shown to produce latent prints as well, or even better, than DFO, since both chemically react with the amino acids in fingerprint residue. Historically, post treatment with zinc chloride and liquid nitrogen were suggested for increasing the fluorescence. Therefore, for this study, 1,2 indanedione was combined with a zinc chloride solution in order to achieve optimal results, and DFO was prepared according to laboratory's established protocol.

In order for Ind-Zn to be introduced into the latent print protocol for developing porous items, it has to yield superior results when compared to DFO. To compare the effects of Ind-Zn versus DFO, strength of fluorescence, quality, and sensitivity were tested on a variety of substrates. Ten different substrates were evaluated and included: yellow and white lined legal paper, white printer paper (28 lb, 98 brightness), white Xerox paper (20 lb, 92 brightness), white envelope, brown Kraft paper, brown packaging paper, newspaper, green file paper, and manila envelope. Substrate samples were cut into approximately 6” x 2½” inch strips. Fingerprints were collected from 18 different donors, 7 males and 11 females, for each substrate. Five prints were collected on each strip in a depletion series with fingerprint deposition residue decreasing with each print, the most being with the first and the least with the fifth print. Moisture content and relative humidity were recorded to help determine effects on latent print development. The strips were cut in half and then treated with either DFO or Ind-Zn. The strips were allowed to air dry for 10 minutes and then oven dried at 100ºC for 20 minutes. The halves were taped back together to compare the latent prints developed by the reagents side-by-side and then subsequently compared with an alternate light source at 495-515 nm using orange goggles. The prints were evaluated for level of ridge detail using an arbitrary scale, and notes were taken comparing the resultant color, quality, and sensitivity of the two reagents. Photographs of each print were taken using a green excitation wavelength of 500-550 nm and a red-orange filter (549 nm) using a Foster & Freeman DCS-3 imaging system.

Results showed that Ind-Zn has superior ability to develop latent prints when compared to DFO and fluoresces a bright yellow on all substrates. DFO fluoresces a lighter orange color and lacks the contrast that Ind-Zn has against all of the backgrounds. Ind-Zn works especially well on newspaper, green file paper, brown packaging paper, and brown kraft paper. On these surfaces DFO either fails to develop the print or lacks sufficient contrast to effectively visualize the print. Ind-Zn proved to be more sensitive by frequently developing all of the prints on the strip more consistently than DFO. After a cost comparison of chemicals used in both formulations, it was determined that Ind-Zn is also less expensive to prepare than DFO.

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