B94 Processing Gaps for 1,2-Indanedione (IND)

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Learning Overview: After attending this presentation, attendees will have a better understanding of the effectiveness of IND and how it compares to other chemical development processes used on porous surfaces potentially bearing latent print evidence. This study also examined latent print development on the non-adhesive side of a variety of commonly used tapes and untreated wood samples.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a more in-depth understanding of the capabilities of IND while encouraging further research into using this in conjunction with other chemical detection methods. This research has determined that IND can further increase sensitivity of detection with the addition of metal salts such as zinc chloride. Adding zinc chloride helps produce better quality fingerprints on porous surfaces than Ninhydrin (NIN) and 1,8-Diazafuloren-9-One (DFO). The benefit of this research may result in an optimal processing sequence for certain unusual substrate surfaces.

Porous surfaces, such as paper, wood, and other cellulose-based materials, tend to absorb water and water-soluble residues found in sweat quickly after deposition. The majority of prints found on these types of surfaces are invisible to the naked eye, which requires specific methods to visualize them. Best practices have typically involved reagents such as NIN and DFO for the detection of latent prints on porous surfaces. However, these reagents do have limitations during latent print development. NIN has often been the method of choice, but it is not as sensitive and does not contain the fluorescent quality produced after development with DFO. Over the past decade, new chemical development methods and technologies have helped improve the quality and increase the specificity of latent print processing on porous surfaces. These were also investigated.

This two-phase study focused on creating an optimal processing sequence for IND. Phase 1 surveyed the success of latent print development on colored and textured substrates using IND, followed by an appropriate enhancement method. Phase 1 was not useful on untreated wood and the non-adhesive side of tapes. These substrates were then moved to Phase 2 for further testing. This focused on the evaluation of four detection sequences for these surfaces: (1) IND-Zn followed by NIN, (2) NIN followed by IND, (3) cyanoacrylate fuming followed by magnetic powder, IND, and Radar Absorbing Materials (RAM) (semi-porous sequence), and (4) only magnetic powder.

In Phase 1, a latent print examiner visually assessed the quality of print and ranked the best and worst processes for each photographed quadrant of the examined substrates after development. The quality of the prints was assessed using Metric 1, followed by ranking the best and worst process indicated by using Metric 2. In Phase 2, the best photograph for each development sequence was provided to the examiner for comparison, using the same metrics. The data was analyzed with a Pearson Chi-square statistical test and significant differences determined when p-value $< .05$.

NIN did not develop any detectable latent prints after IND for untreated wood, masking tape, and blue painter's tape. After IND was applied, the other chemical processes did not show any enhancement. IND worked the best on both wooden substrates compared to NIN. The semi-porous sequence, and the magnetic powder sequence worked the best on the non-adhesive side of the blue painter's tape. Magnetic powder worked the best on masking tape. RAM did not do well with any substrate. Overall, IND did the best on all substrates, except masking tape. Lastly, it was observed that the intensity of fluorescence on the masking tape was lost within seven days compared to the other processes, which did not lose any staining intensity over time. Further research will be done to determine retention quality of fluorescence after IND treatment and shelf life of the reagents.

Indanedione, Porous Surfaces, Latent Prints

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