B59 Performance of the Reflected Ultraviolet Imaging System (RUVIS) in Visualizing Latent Fingerprints on Various Non-Porous and Semi-Porous Surfaces

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After attending this presentation, attendees will understand the correlation between surface chemistry and the ability of the Reflected Ultraviolet Imaging System (RUVIS) to make clear the minutiae of fingerprints on various surface types and under various conditions.

This presentation will impact the forensic community and/or humanity by improving efficiency in the use of the RUVIS in forensic laboratories; it arms fingerprint examiners with the knowledge of which surface types are amenable to RUVIS use. This results in an improved ability to scan large surfaces in order to locate fingerprints, as well as the ability to clearly visualize individual fingerprints on difficult surfaces.

The RUVIS is a hand-held scope through which latent fingerprints appear visible under UV lighting. This is an extremely effective tool for scanning large areas to locate prints, as well as a quick and valuable method for visualizing individual fingerprints, especially on complicated backgrounds.

This study analyzes eight surfaces, each presenting a unique challenge to fingerprint examiners while at the same time being commonly encountered in fingerprint cases. The texturing of Styrofoam, wood veneer, and textured plastics provides difficulty in visualizing fingerprint minutiae. CDs have a highly reflective surface, making the print difficult to separate from its reflection. Magazine pages have highly variable backgrounds which may obscure fingerprint detail. Plastic bags, smooth metal, and glass serve as control substrates, since they are excellent substrates for high quality fingerprints.

The surface chemistry of the eight surfaces is characterized based on surface energy, surface roughness, surface wettability (a corollary to porosity), and elemental composition. These characteristics affect both how the surface accepts a fingerprint, and how the RUVIS interacts with the surface.

To make the study as close an approximation as possible to the conditions a crime scene fingerprint would experience, the test prints are subjected to various environmental conditions (such as simulated sunlight, water submersion, and darkness). Each fingerprint is visualized using RUVIS, then using traditional methods (cyanoacrylate fuming and physical developer). Finally, each print is observed with RUVIS yet again. This serves as a control for inherently poor quality prints, as well as allowing a determination of whether the RUVIS provides significant improvement over traditional methods.

Evaluation of the fingerprints is performed by grouping prints into quality categories using a point system based on the visibility of the core, the delta, and the number of visible minutiae. Statistical analysis then reveals whether there are significant correlations between print quality and the surface characteristics of the surface on which the print was placed and observed.

The value of this study lies in its potential to make RUVIS more usable in the forensic context, and therefore to make fingerprint processing faster and more efficient. If a clear correlation is established between one or two surface characteristics and RUVIS performance, it is likely that a simple test of surface characteristics would allow the fingerprint examiner to determine whether or not to use RUVIS. Examiners armed with the knowledge of surface types not amenable to RUVIS would not miss potentially critical fingerprints by scanning those surfaces at a crime scene in lieu of traditional processing methods.

The study also aims to determine whether RUVIS is more effective before or after the traditional processing methods used (cyanoacrylate fuming and physical developer), and therefore allow fingerprint examiners to get the best results possible from its use in the laboratory.

Though these effects may seem minor, they could add up to improve the performance of latent print units and the clearance of cases. With as high a caseload as is pressed on almost every forensic laboratory in the country, increased efficiency is not a minor detail.

Fingerprints, Surface Chemistry, RUVIS

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