



B81 White-Light Versus Shortwave-Ultraviolet Illumination for Visualizing Fingerprints Developed With Columnar Thin Films of Alq3

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After attending this presentation, attendees will understand how to appropriately illuminate fingerprints developed with Columnar Thin Films (CTFs) of Tris(8-hydroxyquinolino) aluminum, commonly known as Alq3, for visualization.

This presentation will impact the forensic science community by alerting forensic scientists to a currently emerging technique of fingerprint development that may be more valuable than conventional techniques. It will also act as a guide to clarify the appropriate illumination procedures in documenting and analyzing fingerprints that have been developed with Alq3 CTFs. It has previously been believed that shortwave-ultraviolet illumination was best suited to obtain the most detail in fingerprints developed with Alq3 CTFs, but it is hypothesized that white-light illumination will provide as good, if not better, detail in photographs of the developed fingerprints.

The CTF technique preserves the topology of the fingerprint. A CTF is a collection of parallel nanoscale columns. These columns are grown upright atop the fingerprint residue.

In this study, CTFs were deposited on partial bloody fingerprints laid on brass substrates. Brass is a forensically relevant material, being used in such items as cartridge casings and household items. The CTF material used was Alq3, which has an absorption band centered at 259nm, and two fluorescence bands centered at 390nm and 519nm. According to Muhlberger et al., a fingerprint developed by the deposition of an Alq3 CTF is best visualized with illumination by shortwave-ultraviolet light.¹ The goal of this study is to determine which type of illumination is better in order to image the best detail of the fingerprint: white-light or shortwave-ultraviolet illumination.

To accomplish this goal, the partial bloody fingerprints on brass were developed by the CTFs of Alq3, then photographed using different sources of illumination. The quality of the fingerprints after deposition was graded objectively and subjectively. The objective grading was performed using a combination of three software programs that ultimately assigns a percentage score to the fingerprint based on the amount of definitive minutiae. The subjective grading was performed by visual examination and assignment of a score based on the clarity of ridge flow and minutiae.

Initial observations suggested that both the white-light and shortwave-ultraviolet illumination resulted in good-quality photographs of the partial bloody fingerprints. After objective grading of the photographs, white-light illumination is significantly better than shortwave-ultraviolet illumination. Subjective grading also shows a similar trend.

Thus, experiments have shown that contrary to previous knowledge, fingerprints developed by Alq3 CTFs can be better visualized through the use of white-light illumination than shortwave-ultraviolet illumination. Use of the correct type of lighting will allow for better-quality photographs of the developed fingerprints, which is important for identification.

Reference:

1. Muhlberger SA, Pulsifer DP, Lakhtakia A, Martín-Palma RJ, Shaler RC. Optimized Development of Sebaceous Fingermarks on Nonporous Substrates with Conformal Columnar Thin Films. *J Forensic Sci* 2014;59:94-102.

Columnar Thin Film (CTF), Fingerprint Development, Alq3