

Title : Investigation of the Optimal Conditions and Performance of a Self-assembled Cyanoacrylate Fuming Chamber

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ABSTRACT

This study aimed to determine the optimal conditions and evaluate the performance of a custom-built cyanoacrylate fuming chamber for developing latent fingerprints on evidence items. Key factors considered included the amount of adhesive, fuming time, and the number of items per cycle, as well as suitability based on the surface characteristics of the evidence. Kenji brand cyanoacrylate adhesive at 96% concentration was used, and black zip-lock bags measuring 7 × 10 cm were selected as the model substrate to establish optimal conditions. After fuming, the ridge detail was enhanced by fluorescent dyes staining with Rhodamine 6G and Basic Yellow 40, with fluorescence excited using UV light at wavelengths of 365 and 395 nm, respectively, and observed through a yellow barrier filter. The results indicated that the optimal conditions were an adhesive mass of 0.2xxx g, a fuming time of 15 minutes, and no more than 10 items per cycle (total surface area approximately 700 cm²), which yielded fingerprint images sufficiently clear for photography and further forensic examination. When applied to various evidence types, non-porous surfaces showed clear latent fingerprints development, especially when stained with Basic Yellow 40. Certain semi-porous surfaces also produced fingerprints clear enough for imaging and examination, In contrast, some semi-porous items with matte surface coatings exhibited background staining that interfered with latent print analysis. For porous surfaces, cyanoacrylate fuming produced poorly visible latent prints; thus, ninhydrin or alternative techniques are recommended for such substrates. In conclusion, the custom-built cyanoacrylate fuming chamber is effective for developing latent fingerprints on non-porous and, in some cases, semi-porous surfaces. Techniques and dye selection should be tailored to the surface properties of the evidence to ensure reliable results in forensic practice.

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