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Chemical Imaging and Infrared Technology: New Frontiers in the Detection of Latent Fingermarks for Forensic Applications

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Introduction

A key objective in both criminal and civil investigations is the identification of individuals, including victims, suspects, item owners, and authors of pertinent documents. Fingerprint matching is a well-established and widely used technique for personal identification. The palms of the hands are covered by a layer of textured skin that helps improve grip and prevent slippage. The raised patterns on the skin are called friction ridges, while the indentations between them are referred to as furrows or grooves. Dactyloscopy is the study of these friction ridge patterns, and ridgeology is the analysis of ridge structures for fingerprint research. Sweat is released through pore openings scattered across the friction ridges, consisting mostly of water with small amounts of salts (chloride), organic acids, urea, and albumin [1].

Description

The traces of an impression from the friction ridges on any surface of a human or other primate hand are called fingerprints. Friction ridges may also be seen as a print from the foot's sole. Since criminals frequently touch or handle objects when they enter a crime scene, many of their fingerprints are sure to be left there unintentionally. "Chance prints" are the kind of fingerprints the offender left at the crime scene. A person may occasionally pick up a glass or plastic bottle with his hand and place it in a different location. The superglue method is a great way to create latent fingerprints. It is one of the greatest ways to gather one of the most significant kinds of physical evidence.

A fingerprint is an imprint that a human finger's friction ridges leave behind. If the two fingerprints are those of the person in issue, it is unquestionably possible to identify them. Fingerprint evidence is crucial for personal identification. A distinct pattern allows for fingerprint identification. However, only the patterns do not cause it. The pattern and the ridge details or minutiae work together to produce fingerprint identification [2]. It can be used as the main technique for creating latent fingerprints. A visible, sticky white substance that appears along the ridges of the fingerprint is created when superglue reacts with the latent fingerprint's protein, lipid acid, and amino acid traces as well as the moisture in the air. An image of the full latent fingerprint is the outcome [3].

Our initial experiments in this area were completed to document the impact of lowering the temperature of the superglue fuming process on the growth of poly(ethyl cyanoacrylate) from aged latent prints. These results show that lowering the temperature does improve the polymerization of ECA when applied to aged prints as it does to fresh prints. Notably the molecular weight of the grown polymer approaches that which is found in un-aged fumed prints, indicating that the change in initiation and chain growth with temperature is similar for aged and un-aged print and is not affected by degradation or loss of mass of a print during aging. These results therefore suggest that lowering the temperature may improve the quality of the aged print [4].

In many forensic investigations, the recovery and identification of latent fingermarks are vital in recreating a crime scene. A standard, cost-effective, and straightforward method for developing these latent marks from a nonporous substrate is the cyanoacrylate fuming method. This method involves the exposure of a latent mark to the fumes of ethyl cyanoacrylate (ECA), more commonly known as superglue. The most effective procedure for fuming latent marks using ECA involves the rapid heating of the superglue, which causes the heated glue to turn into a white vapor. This vapor then reacts with the fingermark residue it contacts and begins growing polymer along the mark ridges. The result is a fixed and durable, visible coating of the fingermark friction ridges. Throughout this report, the term fingermark will primarily be used, but due to long-term habits, the term ‘print’ will occasionally be used, and should be viewed as equivalent to the term ‘fingermark’ [5].

Conclusion

It is becoming more and more frequent to have thyroid nodules. The most frequent use of FNAC or FNNAC is for thyroid nodules. Such testing is not only intrusive but also needs to be done repeatedly on numerous patients. An affordable, non-invasive, and readily available alternative to FNNAC is ultrasound. However, thyroid nodules lacked uniformity and reproducibility prior to the introduction of TIRADS. TIRADS use is a useful technique for minimising unnecessary invasive procedures. TIRADS classification removes ambiguity in patient management and brings uniformity to reporting. Our research demonstrates a strong association between HPE diagnosis and TIRADS categorization. TIRADS are a useful tool for preventing pointless invasive operations.

Acknowledgement

None.

Conflict of Interest

None.

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