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ORIGINAL ARTICLE

Development and Visualization of Latent Fingerprints by Using Talcum Powder

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ABSTRACT

CONTEXT: Fingerprints are used as reliable evidence in criminal and civil investigations all around the world. There are several methods available for detecting latent fingerprints. Powder dusting is one of the most used methods. The current research began with the need to solve a challenge that arose from an everyday actual forensic work. The latent print on diverse surfaces created for this investigation was developed using talcum powder. Talcum powder is easily available at home and can used by Investigating Officer if fingerprint powders like charcoal powder, aluminum powder, gray powder, fluorescence powder, magnetic powder and others are unavailable.

AIMS: The aim of this research was to see how effective talcum powder can be as a low-cost, non-toxic fingerprint powder, especially in areas where conventional powders are scarce.

MATERIALS & METHOD: 20 samples of latent fingerprints were developed from varied surfaces using a camel hairbrush and powder-dipping techniques. Moreover, adhesive tape was used to lift and collect the fingerprints on to fingerprint cards.

RESULTS: Twenty substrates with diverse surfaces, color, and nature had been chosen to deposit fingerprints, and their development efficiency as investigated using talcum powder. The majority of the fingerprints that were created had big contrast and transparency.

CONCLUSION: The talcum powder can be an effective and inexpensive substitute for other fingerprint powders, particularly in the case of shortage of other powders.

KEY MESSAGES: The non-toxic talcum powder approach is simple to use, inexpensive and effective. The results of this investigation demonstrate that, with a little bit of fingerprint expertise and training, police officers can utilize a readily available product like talcum powder to identify latent fingerprints.

KEYWORDS | fingerprint, talcum powder, personal identification, latent print, forensic analysis

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INTRODUCTION

FINGERPRINTING IS OFTEN THE MOST SUCCESSFUL technique for identifying a person out of all the methods of personal identification known to date. It used all over the world as an infallible form of identification.[1] One of its advantages is its simplicity, as fingerprinting requires minimal equipment. A fingerprint is an imprint made by a human finger's friction ridge.[2] Because of their uniqueness, competence, and consistency over time, fingerprints utilized in criminal investigation.

There are three types of fingerprints, based on its prevalence at the scene of crime. The latent fingerprint found to be present on all

surfaces that a perpetrator may come in conflict with and touch. Paper, polished surfaces, glass, metal panels, doorways, and glass are examples of these surfaces.[3] Friction ridge skin on a surface leaves a latent imprint at the scene of a crime by mistake or by coincidence. This type of fingerprint hidden and go unnoticed. A patent fingerprint is a mark made composed of fluid, lubricant, paint, or grit that is visible to the naked eye.[4] Fingerprints made on sticky paint, paraffin, plaster, resin, soapy, or bitumen known as plastic fingerprints. Humans can easily see plastic prints, and they do not require any further processing to make them apparent. These prints may be present on porous, semi-porous, and non-porous surfaces etc. Experts utilize a powder and brush method on non-porous surfaces, which lifted using clear adhesive tape. On diverse substrate types, latent finger print deposits react differently.[4-5] Furthermore, certain detecting algorithms work on particular surfaces but not others. As a result, while choosing a series of fingerprint detecting algorithms for a certain set of conditions, the surface type is a key factor.[6] Powder selected for development method should be fine-grained, squishy, and greasy. For fingerprint development, police investigators implement a variety of powders, including black powder, gray powder, silver powder, bright powder, magnetic powder and fluorescent powder.[7] There are varieties of techniques that can be use on such surfaces. Over the last two decades, fingerprint powdering has remained largely unchanged as a detection method. There are various powders and brushes to choose from, and the decision is usually dependent on personal preference, availability, and experience. Magnetic powders applied using a magna brush have long been thought to be the least damaging, whereas aluminum flake powders have long been thought to be particularly effective. Magnetic powders have become more sensitive because of the recent creation of iron flake powders. A variety of luminous powders is available for multi colored surfaces. Because latent prints are not visible to the naked eye, they require specific development tools or improvements in order to seen. New ways for detecting latent fingerprints had developed, although the most basic approach for detecting latent prints was powder method.[8] The power sticks to oil, perspiration, or other substances left in the fingerprint if dusted over the region impacted by the fingerprint. Since the early 1900s, this powder method had successfully employed[9-10] various fingerprint powder formulas employed at this time, with each formulation containing a dye for contrast and a resin substance for effective adherence.

MATERIALS AND METHOD

The latent prints developed using a variety of techniques, including black powder, magnetic powder, iodine fuming, cyanoacrylate fuming, and small particle reagent method, silver nitrate method and ninhydrin method.[10]

Sample Fingerprint Preparation

Sample preparation done by preparing fingerprints for each porous surface (colored paper and door slag paper) and non-porous surfaces (glass bottle, metal, printer, doors, window, marble tiles, transparent plastic, plastic plate, bike, chairs, CD surfaces, mobile etc.). Latent fingerprinting obtained by means of plain impressions; the fingerprint printed evenly on several substrates as mentioned above. Complete latent print quality checked and latent prints on all surfaces left at room temperature. Then, within 2 to 5 hours, check again. Each sample was taken in a sebum (oil)-rich state, mostly from the skin, hair, behind the ears, and forehead.

Materials

- Fingerprint brush (camel hair brush)
- Fingerprint powder (talcum powder)
- Camera

Formula of Talcum Powder:

Talcum powder is a hydrated magnesium silicate mineral that has the chemical formula H2Mg9 (SiO3)4 or Mg3Si4O10 (OH)2. It ranges in hue

from white to gray and has a greasy texture. The chemical structure of talc is shown below in Figure 1.

Sample Collection

Twenty samples were collected from various surfaces including bike, car, glass, mirror, chair, wood, almirah, window, door etc. A criminal can easily deposit his latent fingerprints on these surfaces.

To develop fingerprint we can use two different methods as given below:

First Method

- Apply talcum powder lightly on the latent fingerprints by spraying to make it visible; using a soft camel hairbrush light strokes should made.
- Brush motion performed along the flow of ridges once the shape of a pattern observed. This aids in the removal of surplus powder stuck between the ridges without causing damage to the ridge.
- With the aid of a camera, a developed fingerprint captured.

Second Method

- Powder applied to a surface by dipping a brush into a powder container, trapping powder on the developing surface.
- When powder brushed over an area with a latent print, particles stick to the oily deposit.
- Remove any excess powder from the region around the fingerprint pattern.
- When the patterns standing out against the backdrop and captured using a camera.
- Lift the fingerprint using transparent adhesive tape after pattern formation and save it on a fingerprint card for future use.

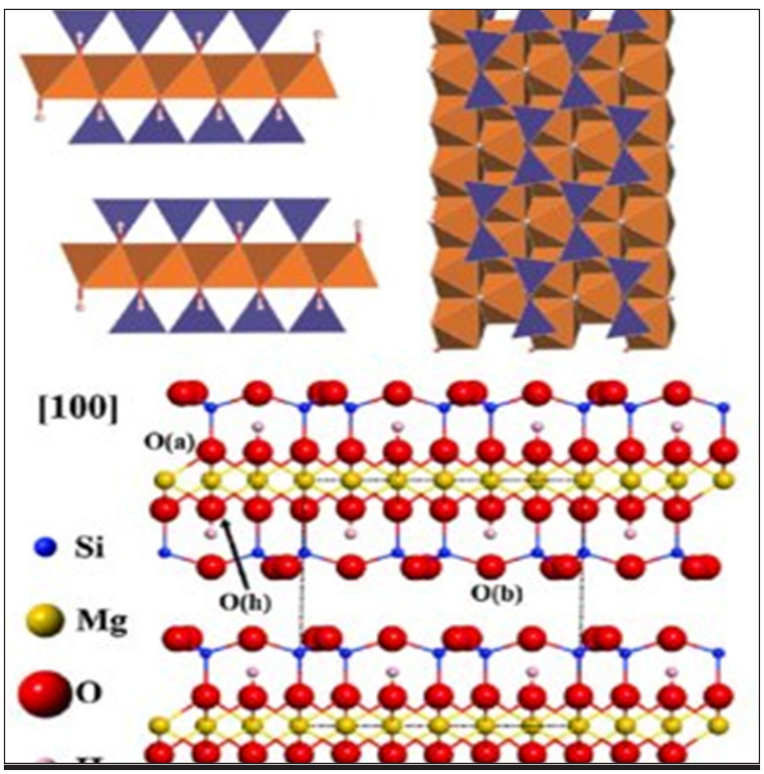

Figure 1: The chemical formula for Tallcum powder

RESULTS AND DISCUSSION

The shape of the fingerprints generated, color contrast on the surface, and contrast effect on the test time span were all investigated using manual identification of the findings of the creation of visible latent fingerprints. Brushing powder onto a print surface is a simple and straightforward method, but it has the drawback of destroying the ridge features of brushes that exposed to the surface, which have mold crushing capabilities. The surface area and color contrast provided by talcum powder affected by size of the powder. Talcum powders such as Johnson & Johnson, Eve body powder, Nivea Pure, Spinz, Yardley London, and others are available on the market. When compared to coarse powder, fine-grained powder produces superior results.

The goal of this research was to offer a readily available household product like talcum powder for developing latent prints on non-porous and porous surfaces and to investigate the impact of talcum powder on the working area.

The ridge quality of the latent fingerprint created with talcum powder is excellent. On various surfaces such as colored paper, metal, glass, steel, marble tiles, and so on, talcum powder produces a superior effect. Even several days after contact, talcum powder has shown to be very efficient in producing an outstanding latent print.

The results of developing latent fingerprints with Talcum powder on various surfaces are displayed above. The majority of the surfaces investigated have latent fingerprints that can be successfully produced with fingerprint powder.

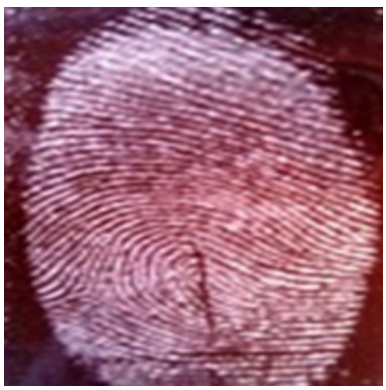

Figure 1: Finger print on a bike

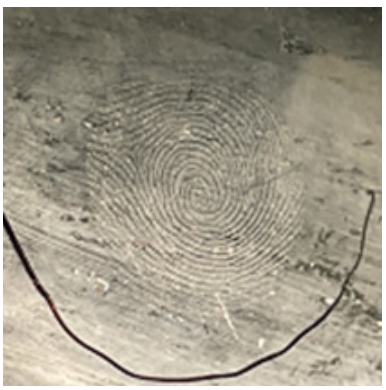

Figure 2: Finger print on glass bottle

Figure 3: Finger print on water bottle

Figure 4: Finger print on a plastic plate

Figure 5: Finger print on a stapler

Figure 6: Finger print on ornament

Talcum powder interacts with sweat on the skin to form a distinct ridge pattern. Figure 1 depicts a fingerprint's ulnar loop pattern on the bike's surface. Figure 2 shows a simple whorl design on a glass bottle. Figure 3 shows a talcum powder-created radial loop design on a water bottle. Figure 4 shows a composite loop and whorl design on a plastic plate. Fig. 5 shows a plain whorl design with a slight ridge visible on the stapler due to talcum powder. Figure 6 shows a palm fingerprint on an ornamental metal object. The fingerprint developed on the Canon printer shown in Figure 7. Figure 8 depicts the radial loop pattern on the mirror surface. We can gather fingerprints from many surfaces, such as metal, glass, and doors, using talcum powder as illustrated in Figures 9 & 10.

Figure 7: Finger print on Canon printer

Figure 7: Finger print on steel article

Figure 9: Finger print on miror

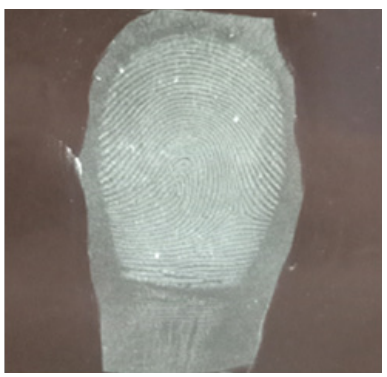

Figure 10: Finger print on door

CONCLUSION

According to the findings of this investigation, the creation of latent fingerprints was achieved successfully using the talcum powder dusting method. Talcum powder is economical since nearly all of it is recovered and reused. It is also simple to use and less cumbersome. Talcum powder, unlike certain chemicals and black powder, does not pose a carcinogenic danger. People can use talcum powder if a police officer is not present at the site of the crime, or police officers can utilize this approach on their own in the absence of a forensic fingerprint kit or specialist. IJFMP

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