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Development of Latent Fingerprint Impressions Using Mica Mineral Powder

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Abstract:

Fingerprints are unique identical characteristic of a person. These are the impressions left by the friction ridges and furrows on epidermis layer in human finger on contact with any surface. The primary advantage of a fingerprint is that it does not change over time and play a crucial role with Criminal Justice System in criminal identification and for criminal data record. Fingerprint identification is the process to identify the impressions of fingerprint formed by the minute ridges present on the fingertips. Fingerprints have certain individual characteristics which are unique even in the identical twins. Fingerprints are most generally recovered from crime scene. These impressions are obtained when natural oils and perspiration (sweat) exist between the ridges and furrows of fingertips and get transferred to a surface by any contact. Latent Fingerprints are invisible and harder to detect and preserve, so, can be obtained by the physical or chemical methods. In this paper, my research focuses on developing latent fingerprints or invisible fingerprints using Mica mineral powder on various surfaces. Here I used the Mica mineral powder (abeer - अबीर) generally used in worshiping god and goddesses in India, which is used for obtaining latent fingerprints.

Keywords: *Latent, Fingerprint, Mineral, powder, Crime scene, Mica, development, photography.*

INTRODUCTION:

According to the idea put forth by Sir Dr. Edmond Locard, "every contact leaves a trace," and fingerprints are the trace left by human fingertips. A fingerprint is the mark or impression that a person's fingertips make on any surface. These fingerprints are created by the friction ridges and furrows found on human fingertip epidermal layers, which combine to create a pattern that reflects each person's distinct personality. Sweat is produced by sweat glands beneath the skin, which are connected to a variety of pores in each ridge. Sweating causes imprints to form on another surface whenever our hands come into contact with any surface. The friction ridges form some common types of patterns in human fingers which are – arches, loops, whorls and composites (including accidental) patterns. Between these patterns special characteristics like core, deltas, enclosures, bifurcations, etc. are present on various different areas making the fingerprints unique. These fingerprints are one of the maximum treasured styles of proof as they are unique, individual and permanent. The fingerprints can be found at any surface or object at the crime scene as evidence and can be visible (patent prints), invisible (latent prints) or 3-dimentional (plastic prints); also can be chance prints or partial prints and katent prints using them to find suspects or criminals linked with the crime scene. The invisible prints found at the crime scenes are known as “latent fingerprints”, which are not apparent to naked eyes but can be developed using physical and/or chemical methods. The physical method for fingerprint development can be alternative light source (ALS) method followed with powder method which includes various lights, their sources and various different colored powders of according to the color and texture of the surface. The Chemical methods include iodine fuming method, cyanoacrylate fuming method, etc. The latent prints can be discovered on lot of surfaces even on human body but they’re not very easily visible and detected for using fingerprint powders, chemical reagents or exchange mild sources. The fingerprint powder adheres with the components of sweat in prints and makes the latent prints

visible and shows the ridge patterns. Latent prints do not have fluorescing components naturally; hence sometimes need fluorescent powders for developments. The powder method for finding hidden fingerprints involves gently brushing a fine powder onto the fingerprint using a soft brush, like ostrich feather brush, camel hair brush, soft makeup brush or glass-fiber brush.

Practically, the impressions can be classified into three classes consistent with kind of surfaces on which they may be visible or determined. Fingerprints on smooth surfaces (including soap, wax, moist paint, etc.) are probably 3-D or plastic prints. Fingerprints on tough surfaces (like, steel, glass, etc.) can be latent or patent prints. Visible (Patent) pints can be formed by blood, dirt, ink, paint, etc. on transfer from fingers to the various surfaces and can be found on various surfaces like smooth, rough, porous, non-porous and semi-porous.

The primary focus of this research study is the production of latent (invisible) fingerprints using mica mineral powder. The silicate mineral group known as mica is distinguished by its flawless basal cleavage, glossy appearance, and sheet-like (phyllosilicate) structure. Its monoclinic crystal structure is made up of interconnected silicate tetrahedra (SiO4). Iron and magnesium are abundant in it. Mica contains the following elements: silicon, aluminum, potassium, magnesium, iron, lithium, sodium, fluorine, and hydroxyl group (OH) hydroxide ions.

MATERIALS AND METHODOLOGY:

Latent prints can be developed in a variety of ways. One popular technique for developing latent fingerprints is the powder method. This study uses mica mineral powder to generate prints, which is a novel approach to latent fingerprint creation. The mica mineral powder approach was used to extract the latent fingerprints from a variety of surfaces, including mirrors and cell phone screens. This mica powder is typically offered at inexpensive prices as "abeer" by a variety of businesses, including cosmetic shops and industries. In cosmetic goods, abeer/mica powder is highly helpful since it has relaxing and stress-relieving qualities and provides skin a natural radiance.

A surface where prints are to be developed and identified is dusted with the powder. Ostrich hair, horse hair, or soft cosmetic brushes are examples of clean, soft brushes that are used for dusting. The color of the brush is chosen based on the color of the powder; a dark brush is used for mica mineral powder, which has a very pale tint. Apply a small amount of powder to the surface with the brush to get a clear print. Due of its light tone, mica mineral powder is mostly suitable for use on dark surfaces. Without causing any damage to the prints, carefully remove the access powder. Sweat, oil, and other constituent particles are transferred from fingertips as surface imprints, which causes the powdered nanoparticles to stick to the prints when dusting is completed. Using a variety of light sources and filters, take detailed pictures of the prints from various angles once the latent fingerprints with the ridges and their patterns have developed. Now, gently remove the prints using cellophane tape, and store them on a dark fingerprint card for future use. recognizing ridge features, patterns, etc. By looking at the produced latent prints, examinations are simple. The criminal court system can locate the individuals involved in specific crimes with the aid of these prints, which can also be saved for future criminal identification.

RESULT AND DISCUSSION:

Result of the research on the development of latent (invisible) fingerprints using mica mineral powder from different surfaces like mirror, mobile phone screen, etc. are shown in below mentioned in table 1 using mica mineral powder.

Surfaces on which latent prints are developed	Pictures
Mobile Phone Screen	
Stainless Steel Utensil	
Aluminum Railing	

Ophthalmic Glass	
Mirror	

Table 1

The powders are excellent medium to develop the latent or invisible prints. As mica powder is off white or white in color, it gives excellent results on dark color surfaces. Thus, the results of the research reveals that the latent fingerprints present on the majority of surfaces can be examined successfully using mica mineral powder on performing the powder method for the visualization of these invisible prints. It is manifested that this powder provides good results on contrasting dark color surfaces than on light color surfaces.

The development of latent fingerprints on various surfaces like, mobile screen, ophthalmic glass, etc. can be successfully done and their further examinations and analysis can be done clearly. This is just a preliminary investigation and can be explored further.

CONCLUSION:

The mica mineral powder is a good alternative for white powder used at crime scene by fingerprint experts. It is a natural mineral powder and also be considered as organic powder. This powder in white or off white in color and so can be used on dark surfaces for developing the latent fingerprints. This mica mineral powder is commonly available at various cosmetic firms at low price. Generally, mica mineral is found in sheet or fibrous structures and then it is collected and powdered easily. This powder can be successfully used on different surfaces at crime scenes and evidences found to help criminal investigations. The prints are successfully developed using mica mineral powder on all the surfaces (Metal, Glass, Oil Paint, Plastic, Rough Plastic, Mirror, Car key and Mobile screen) and have clear ridge characteristics visibly present.

So, we can conclude that mica mineral powder can be successfully used on various surfaces for the development of latent fingerprints.

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