CHAPTER -1

INTRODUCTION

Finger Prints are natural unique patterns formed by friction on epidermal ridges [raised] and furrows [recessed], which appear on the pads of fingers and thumbs. Though these epidermal ridges are found on fingers, palms, and soles, they are popularly called just fingerprints. They have never been observed repeating in any human being in the history of Dactylography.

Dactylography is a Greek term which means identification of individuals by means of examination of the lines on the tips of the fingers.

The skin of fingers shows the sweat gland, which releases sweat consisting of water, salt and urea, and the sebaceous gland, which releases oils on the surface of the skin. The products of these two glands lead to constitute a finger print, a mark that is left when we touch something.

Finger prints have often been and still are considered one of the valuable types of physical evidence in identification. It has been a constant since the birth of mankind. Over the several thousand years man has been in existence, fingerprints have not changed.

There are three types of fingerprints that is latent prints, plastic prints, patent prints are visible prints that occur when a foreign substance on the skin of a finger comes in contact with the smooth surface of another object. These prints leave a distinct ridge impression that is visible with the naked eye without technological enhancement of any kind. And the plastic prints are visible, impressed prints that occur when a finger touches a soft, malleable surface resulting in an indentation. Some surfaces that may contain this type of fingerprint are those that are freshly painted or coated, or those contain the wax, gum, blood or any other substances that will soften when hand held and then retain the finger ridge impressions. And the latent prints are fingerprint impressions secreted in a surface or an object and are usually invisible to the naked eye.

Development of latent fingerprints by physical method. Fingerprint powders applied lightly to a non-absorbent surface with a soft brush. They readily adhere to sweat residues and/or deposits of body oils left on the surface. The investigators need to prevent damaging the print when trying to develop it. Camel hair is the most common animal hair used to make fingerprint brushes.

New technique have been developed for latent fingerprint detection but the traditional fingerprint detection technique for treating latent fingerprints is powdering method. When the powder sprinkled over an affected area, the powders adheres to the oil, sweat or other material left in a fingerprint. Powdering technique has been used as a technique since the early 1900s. Over this period, many fingerprint powder formulations have been in use, with each formula consisting of a colorant for contrast and a resinous material for good adhesion. Hundreds of fingerprint powder formulas have been developed over the year. In general there are four class of fingerprint powders- regular luminescent metallic and thermoplastic.

Powders may be applied with a fingerprint brush, a brush with extremely fine fibres designed to hold powder, and deposit it gently on the fingerprint to be revealed, without rubbing away the often delicate residue of the fingerprint itself. They may also be applied by blowing the powder across the fingerprint, or by pouring the powder onto the print, and then blowing away the excess. Magnetic powders are also used, where a fine magnetic powder is held by a magnetic applicator, which may then be gently moved across the fingerprint. As no bristles touch the surface, this often damages the print less than other methods of developing the print.

Physical development of fingerprints using powders is just one of a selection of methods used to develop fingerprints. Fingerprints often leave residues of oils in the shape of the friction ridges, but the friction ridge skin itself does not secrete oils, and so some fingerprints will only leave a residue of amino acids and other compounds which the powder does not adhere to well. For this reason,

'Dusting' is used as part of an array of techniques to develop fingerprints, but is often used on larger areas in a crime scene which cannot be removed for analysis, or cannot be subject to more rigorous analysis for other reasons.

Fingerprint powders have various formulations, and the appropriate powder must be used on the appropriate surface. For example, dark coloured powders will show up a fingerprint far better on a light surface.

Figure 1.1 Development of latent fingerprint by Dusting Method

Figure 1.2 [A] Patent Fingerprint [B] Plastic Fingerprint [C] Latent Fingerprint

CHAPTER – 2

LITERATURE REVIEW

2.1 B.J Jones A J (2014) He studied on the topic "Nano-scale composition of commercial white powders for development of latent fingerprints on adhesives "Titanium based powders are regularly used in the development of latent fingerprints on dark surfaces. For analysis of prints on adhesive tapes, the titanium dioxide can be suspended in a surfactant and used in the form of a powder suspension. Commercially available products, whilst having nominally similar composition, show varying levels of effectiveness of print development, with some powders adhering to the background as well as the print X-ray fluorescence (XRF), analytical transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS) and laser particle sizing of the fingerprint powders show TiO_2 particles with a surrounding coating, tens of nanometres thick, consisting of Al and Si rich material, with traces of sodium and sulphur. Such alumina silicates are commonly used as anti-caking agents and to aid adhesion or functionality of some fingerprint powders; however, the morphology, thickness, coverage and composition of the alumina silicates are the primary differences between the white powder formulations and could be related to variation in the efficacy of print development.

2.2 Rakesh K. Garge et.al (2011) He studied on the topic " A new technique for visualization of latent fingerprints on various surfaces using powder from turmeric" This paper presents a new powdering technique which is simple, nontoxic Various methods have been reported for the development of latent fingerprints on different surfaces in the literature. This paper presents a new Powdering method which is simple, non-toxic for the development of latent fingerprints that can be employed on different substrates. In this Investigation a less expensive, simple and easily available, turmeric powder, a common ingredient in Indian food, has been used to decipher the latent fingerprints on nine different substrates. It is found that it gives very clear results in majority of the surfaces.

2.3 Meng Wang Ming Li et al (2010) she studied on the topic "Rare Earth Fluorescent Nanomaterial for Enhanced Development of Latent Fingerprints" The most commonly found fingerprints at crime scenes are latent and, thus, an efficient method for detecting latent fingerprints is very important. However, traditional developing techniques have drawbacks such as low developing sensitivity, high background interference, complicated operation, and high toxicity. To tackle this challenge, they are synthesized two kinds of rare earth fluorescent nanomaterial, including the fluoresce red-emitting YVO4: Eu Nano crystals and green-emitting

2.4 LaPO4:Ce,Tb Nano belts, and then used them as fluorescent labels for the development of latent fingerprints with high sensitivity, high contrast, high selectivity, high efficiency, and low background interference, on various substrates including non-infiltrating materials, semi-infiltrating materials, and infiltrating materials.

2.5 G S. Sodhi J K et al she studied on the topic "Powder method for detecting latent fingerprints: a review" The powder technique for detecting latent fingerprints involves the application of a finely divided formulation to the finger-mark impression, generally with a glass-fibre or a camel hair brush. The powder gets mechanically adhered to the sweat residue defining the ridge pattern. The furrows which are devoid of the fingerprint residue, do not adhere the powder onto them. The final outcome is that the powder formulation sticks to the ridges, but is easily blown off the furrows. Since the powder is normally coloured, the ridge pattern becomes visible and the latent print is said to have developed.2.5 Kulvir Singh el.al (2012) he studied on the topic "Visualization of latent fingerprints using silica gel G a new technique" This paper presents a new powder method for the development of latent fingerprints on different substrates. In this study, a less expensive, simple and easily available, silica gel G powder (usually used in TLC plates preparation) has been used to develop the latent fingerprints on eight commonly encountered different substrates i.e., plastic, glass, ordinary mirror and metallic substrates, aluminium foil sheet, carbon paper, matchbox, cardboard, glossy-painted wooden substrates, top and writable surface of CD and glazed coloured magazine paper surface. It is observed that it gives very clear results on most of the substrates with clear ridges.

2.6 Somava Madkur (1991) she studied on the topic " Flake Metal Powders for Revealing Latent Fingerprints" Fine flake powders, having flake diameters ranging from 50 to 1 μm and stearic acid/powder ratios varying from 0 to 50 weight percent, were produced by laboratory-scale milling of aluminium, zinc, copper, and iron powders. The effectiveness of these flakes for detection of latent fingerprints was then assessed by comparing the print qualities obtained when using these flake powders with those achieved using commercial aluminium, commercial black, and commercial dark magnetic dusting powders. While the commercial aluminium powder was found to have an average flake diameter and stearic acid level close to the optimum values required to obtain bright fingerprints, several potential avenues of development were identified which could lead to the commercial availability of superior black powders

2.7 Abeer sheta (2011) he studied on the topic "Development of latent fingerprints on non-porous surfaces recovered from fresh and sea water" Cyanoacrylate developed latent prints found to have the highest mean visibility score after submersion in fresh and sea water for 1, 2 and 10 days. Mean visibility score of prints developed showed significant decline after 10 days of submersion. Prints submerged in fresh water showed significantly higher mean visibility score than those submerged in sea water using various methods of development and in all time intervals.

2.8 Ashish badiye et.al (2017) He studied on the topic that "DEVELOPMENT OF ATURAL LATENT FINGERPRINT POWDER FROM DURIAN SEEDS - A GREEN AND EFFECTIVE APPROACH" This invention relates to a latent Fingerprints powder. The currently available latent fingerprints are usually ineffective if the fingerprint left is not within the first week after placing the latent. The latent fingerprints visualization chemicals are toxic and potential health hazards. To overcome this problem it is provided that the Durian Seeds are made into a powder form for the development of cheaper and more effective latent fingerprint powder for better visualization. Seeds of Durian was rich in starch and will produce white powder. The powder will adheres to the residue deposited from the fingers onto the surface that we touch. The reason is also for the adherence of Durian seeds powder to the

Latent finger-marks can be assigned by the formation of hydrogen bonds between the fatty acids/glycerides of sebum and the carbonyl and hydroxyl group of the components in Durian seeds powder. The latent fingerprint powder produced from durian seeds showed better visualization

2.9 B.J JONES (2010) He studied on the topic that "effect of substrate surface topography on forensic development of latent fingerprints with iron oxide powder suspension" Latent fingerprint deposition and effectiveness of detection are strongly affected by the surface on which prints are deposited. Material properties, surface roughness, morphology, chemistry and hydrophobicity can affect the usefulness or efficacy of forensic print development techniques. Appropriate techniques and sequences of processes for broad categories of operational surfaces. This study uses atomic force microscopy and scanning electron microscopy to investigate a series of surfaces classified as smooth, non-porous plastic. Latent prints developed with iron oxide powder suspension are analysed on a range of scales from macro to Nano to help elucidate the interaction mechanisms between the latent fingerprint, development agent and underlying surface. Differences between surfaces have a strong effect, even within this single category. We show that both average roughness and topographical feature shape, characterised by Skew, kurtosis and lay, are important factors to consider for the processing of latent fingerprints.

CHAPTER – 3

AIM AND OBJECTIVES

AIM:

To develop latent fingerprints on various surfaces by Rice powder, Maida powder, Red Sandalwood powder.

OBJECTIVES:

1. To identify a new technique for development of latent fingerprints.
2. To develop an organic and chemical fingerprint powder unlike the presently used chemical powders.
3. These powders are easily available less expensive comparatively existing powder.

CHAPTER – 4

MATERIALS AND METHODOLOGY

MATERIALS REQUIRED

SURFACES:

1. Granite
2. Aluminium surfaces
3. Iron surfaces
4. Plywood surfaces
5. Plastic surfaces
6. Sofa surfaces
7. Metal surfaces

POWDERS:

8. Rice powder
9. Maida powder
10. Red Sandalwood powder

OTHER MATERIALS:

11. Camera
12. Mask
13. Gloves
14. Lens
15. Brush (Ostrich Feather brush)

METHODOLOGY

The surfaces [non-porous] were selected first where the impression of fingerprint is to be left and then developed by using Rice powder, Red Sandalwood powder, Maida powder. Firstly the subject is asked to wash and dry their hands clean, to eliminate the possibility of contamination by any extraneous substance, dirt or dust for taking the impression of fingerprint. Then take the impression of the subject on to the given surfaces. The impressions of the subjects were taken on different surfaces then the latent fingerprint is developed by powder method.

The method used in the development of latent fingerprint is powder dusting. It is a physical method of enhancement of latent prints and work on the mechanical adherence of the fingerprint powder particle to the oily components of the skin ridge deposit. The application of powder to the print by brushing is a simple and easy method but it also has disadvantages that the brushes on coming I contact with the surface having the print destroy the print and hence the ridge characteristics get destroy. After deposition, the prints were left in the room condition. The experiment was conducted in the month of January –February. The temperature during the experimental work varied from 24 to 30 degree Celsius and 70%relative humidity.

The development of latent prints is done after taking impressions of the subject on various surfaces [non- porous] by powdering method using rice powder, Maida powder, dal powder. The commercially available powders are prepared by drying and grinding to get a very fine powder to the level of talcum powder. The powder was then kept in a sterile glass bottle and sealed. The powdering method has been used a suitable brush such as ostrich feather brush and camel hair brush. The powder sprinkled over the surface where the latent fingerprint was present. The excess powder was removed by gentle tapping and by slowly using the brush over the prints and to get a clear print. This powder has been applied on both the porous and non-porous surfaces. After developing the latent print, it was photographed.

This method was applied on the surfaces of computer backside, plastic surfaces, non-porous wooden surfaces, granite, aluminium surface, metal surface, iron surfaces, sofa, mobile phone case surfaces, and plywood surfaces etc. where the subject fingerprint impression has been taken. Before approaching this method, we should confirm that wearing of mask, gloves, and other material to avoid the contamination of latent fingerprint.

Chapter: 6

RESULT AND CONCLUSION

5.1 RESULT

Latent fingerprints were developed by using rice powder, Maida powder and red sandal wood powder. Compared to the other development techniques used for the enhancement of latent fingerprint, this powders are easily available and it will give good result. Maida powder will give clear prints but it not clear more than remaining powders. But it will give result on white surfaces.

The comparative analysis of different surfaces with this powders will give good result on contrast surfaces. And this prints are similar of usually used developing fingerprints. Every surfaces will give good result with clear ridge, the investigators can use this powder for developing latent fingerprint from the scene of crime.

The red sandal wood powder will give good result on the surfaces of granite, plywood surfaces, plastic surfaces aluminium surfaces, metal surfaces, laptop keyboard surface the fingerprint was developed partially, iron surfaces, wooden surfaces. Maida powder will give good result on the granite, sofa surfaces, metal surfaces, plastic surfaces, wooden surfaces, and the rice powder will give good result on the granite plywood surfaces, aluminium surfaces, wooden surfaces, plastic surfaces, iron surfaces, sofa surfaces, and iron surfaces.

VISUALIZATION OF LATENT FINGERPRINT BY RICE POWDER

Figure 5.1 Developed fingerprint on Granite

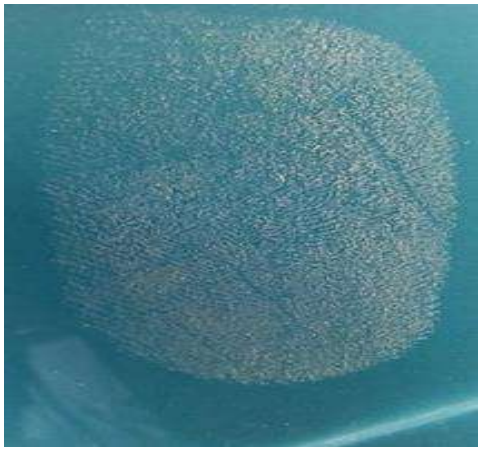

Figure 5.2 Developed fingerprint on Plastic surface

Figure 5.3 Developed fingerprint on Iron surface

Figure 5.4 Developed fingerprint on Sofa surface

Figure 5.5 Developed fingerprint on Plywood surfaces

Figure 5.6 Developed fingerprint on Aluminium surface

VISUALIZATION OF LATENT FINGERPRINTS BY MAIDA POWDER

Figure 5.7 Developed fingerprint on Metal surface

Figure 5.8.Developed fingerprint on Aluminium surface

figure 5.9.Developed fingerprint on Laptop surfaces

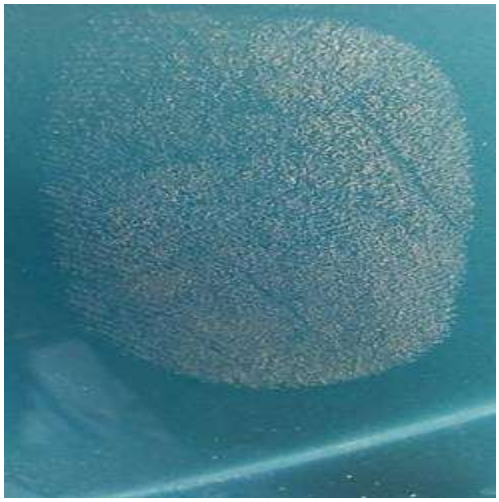

Figure 5.10 Developed fingerprint on Plastic surfaces

VISUALIZATION OF LATENT FINGERPRINT BY RED SANDAL WOOD POWDER

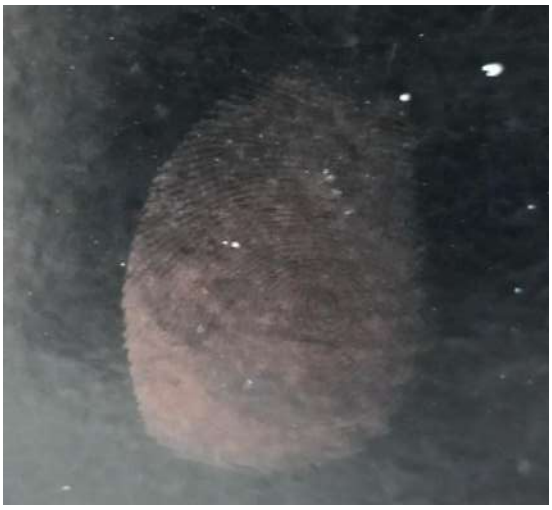

Figure 5.11 Developed fingerprint on Plywood surface

Figure 5.12. developed fingerprint by on Granite

Figure 4.13. Developed fingerprint on Metal surfaces

Figure 4.14. Developed fingerprint on Laptop surfaces

CONCLUSION

In the present study, the fingerprints are visualized by using the powder which are easily available and not harmful compared to other powders available in the market. Further work on the department of fingerprints under various conditions such as temperature variation, relative humidity from the surface of human skin and other variant surfaces can be done.

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