CHAPTER I: INTRODUCTION

The super glue or cyanoacrylate method is a forensic science technique that uses the vapours of super glue to develop latent fingerprints. A latent fingerprint is a fingerprint left on a surface as a result of the oils and perspiration from the pores of the finger. The fuming is performed in a developing chamber using super glue and water which allows the vapours to adhere to the fingerprint, making the fingerprint visible. Once the print is visible, you can enhance it by using dyes or powders. Super glue fuming is a way to make a fingerprint semi-permanent so the print can be dusted (lightly brushing fine powder onto the residue left by a fingerprint) and tape-lifted (use tape to put over the developed fingerprint and lift the print and place onto a fingerprint card) various times, and not be disturbed or ruined.

Selecting appropriate developing methods to enhance the effect for fingerprint development is of great significance of practical forensic investigation. Ethyl-2-cyanoacrylate ester (superglue) fuming is a popular method for “in situ” developing fingerprints in forensic science. In order to determine the length of time to develop a fingerprint, a control print can be used. An oily fingerprint can be placed onto a plastic baggie or a piece of aluminum foil. Then as the prints develop, the control print can be watched to determine the amount of time the evidence should be left to develop. A latent fingerprint examiner or a person trained in fingerprint evidence is qualified to perform the fuming of fingerprint evidence.

The cyanoacrylate fuming method (often called the super glue method) of developing latent fingerprints has proven to be an effective tool for professional investigators, and the quality of its results have made it a popular one. Any agency that works with latent fingerprints and does not already use the cyanoacrylate fuming method should seriously consider adopting it. The super glue method was first employed by the Criminal Identification Division of the Japanese National Police Agency in 1978. Shortly thereafter, it was brought to the United States by the United States Army Criminal Investigation and Bureau of Alcohol, Tobacco, and Firearms Laboratories. It is currently used in most state and metropolitan police force across the country. [11]

Chemical processes involved in the development of latent fingerprints using the cyanoacrylate fuming method have been studied in clean and smooth surface. However the mechanistic details of the reaction between the fingerprint residue and the cyanoacrylate vapor are not well understood. The cyanoacrylate polymerization process is extremely rapid. When heat is used to accelerate the fuming process, typically a period of 2 min is required to develop the print. The optimum development time depends upon the concentration of cyanoacrylate vapors within the enclosure.

To understand how the super glue method works, one must first know some basic information about fingerprints themselves. There are three different types of fingerprints: visible, impression, and latent. Investigators normally need a portable, permanent copy of the fingerprints. A photograph can generally fulfill this need. Of the three types of fingerprints, visible fingerprints can be photographed directly, and impression fingerprints can usually be photographed under special lighting conditions. It is only the invisible latent fingerprints that are difficult to photograph. They must first be made visible. There are three general groups of techniques for making latent fingerprints visible, and virtually every known method can be categorized into one of the three groups or a combination of the three. The three groups consist of the physical techniques, the chemical techniques, and the instrumental techniques. Cyanoacrylate fuming is a chemical technique.

Latent fingerprints are composed of several chemicals exuded through the pores in the fingertips and are left on virtually every object touched. The primary component of latent fingerprints is ordinary sweat. Sweat is mostly water, and will dry after a fairly short period of time. The other components of latent fingerprints are primarily solid, however, and can remain on a surface for a much longer period of time. These other components include organic compounds like amino acids, glucose, lactic acid, peptides, ammonia, riboflavin, and isoagglutinogens as well as inorganic chemicals like potassium, sodium, carbon trioxide, and chlorine.

The basic concept behind all of the chemical techniques is to apply something that will chemically react with one of the constituent chemicals of latent fingerprints to the area suspected of containing such a fingerprint. The resulting reaction will give all present latent fingerprints a new chemical composition. This new chemical composition will make the latent fingerprints easily rendered visible, and they can then be photographed.

The super glue method is no exception to this rule. Most liquid super glues are really either methylcyanoacrylate or ethylcyanoacrylate. Less common types of super glue include butylcyanoacrylate and iso-butylcyanoacrylate. Fortunately, all these types of super glue are nearly identical physically and chemically. Super glue reacts with the traces of amino acids, fatty acids, and proteins in the latent fingerprint and the moisture in the air to produce a visible, sticky white material that forms along the ridges of the fingerprint. The final result is an image of the entire latent fingerprint. This image can be photographed directly, or after further enhancement.

To enable such a reaction to take place, the cyanoacrylate must be in its gaseous form. The basic procedure to develop latent fingerprints using super glue takes this fact into account, but is still not overly complicated. The surfaces that are to be checked for latent fingerprints are placed in an airtight tank along with a small heater. A few drops of liquid super glue are placed into a tiny, open container, and the container is placed on top of the heater inside the tank. The tank is then carefully sealed, and the heater activated. According to Lee and Gaensslen, the boiling point for most super glue varies between forty-nine and sixty-five degrees Celsius (roughly one-hundred twenty to one-hundred fifty degrees Fahrenheit) depending upon its exact chemical composition. [12]

Once the super glue in the container reaches its boiling point, it will begin to boil away into the surrounding atmosphere, creating a concentration of gaseous cyanoacrylate. If any latent fingerprints exist anywhere inside the tank, they will eventually be exposed to the gaseous cyanoacrylate. This exposure and the natural humidity contained in the atmosphere are enough to trigger the reaction automatically. Thus, once everything has been set up, the investigator merely waits for the reaction to occur. The whole reaction can take over two hours, with the exact time determined by the size of the tank, the concentration of the gaseous cyanoacrylate in the air, the humidity of the air, and numerous other factors. Since it is in practice very difficult to calculate this amount of time in advance, the reaction must be monitored to insure that it is not allowed to continue for too long. If it runs unchecked, the latent fingerprints can overdevelop; the chemical images of the ridges will slowly grow wider until they overlap, obscuring vital detail.

There are a few methods by which the process may be accelerated. These add to the complexity of the basic procedure, but offer vast improvements in the speed of the reaction. Most agencies that use the super glue technique for developing latent fingerprints employ at least one acceleration method; many agencies, like the Boston Metropolitan Police Crime Lab2, use two. The three most common acceleration methods are the fume circulation method, the chemical acceleration method, and the water vapor method.

The fume circulation method is fairly straightforward in principle; if the cyanoacrylate fumes are actively circulated around the tank, the air inside will have a constant concentration of them and all latent fingerprints in the tank will be in constant contact with some cyanoacrylate. In practice, the fumes can be forced to circulate by the strategic use of a couple of electric fans inside the tank.

The chemical acceleration method is quite different from the other acceleration methods. Instead of being an addition to the basic procedure, the chemical acceleration method is a replacement for part of it. When the chemical acceleration method is used, the heater is discarded and a chemical like sodium hydroxide is placed in contact with the super glue. This chemical will cause the super glue to produce cyanoacrylate fumes, and the reaction will then proceed normally.

The water vapour method is extremely simple in theory and in practice. Since the reaction requires moisture from the air to occur, the air in the tank can be kept at a high level of humidity to ensure that there will always be enough moisture for the reaction to take place. The humidity in the tank can be kept high simply by placing an open container of water inside the tank.

Regardless of whether or not an acceleration method was used, the final image of the fingerprint is not always easy to photograph. Since the chemical deposits left by the reaction are white, there may not be enough contrast for an effective photograph to be taken if the surface they are on is also white.

If this is the case, a simple method exists that solves the problem. This is the technique of dusting. Different colored dusts may be brushed onto the image of the fingerprint, and they will cling to the sticky white chemical from which it is formed, effectively changing its color. The super glue technique produces outstanding results on all non-porous surfaces like metal, glass, and plastic; it will sometimes work on porous surfaces too, but not as well.[13]

Overall, the super glue technique is an excellent means of developing latent fingerprints. It stands as one of the best methods of obtaining one of the most important types of physical evidence. It can be highly recommended to any agency that has not already adopted it as a primary method of developing latent fingerprints.

Cyanoacrylate, also called super glue, fuming is a chemical method for the detection of latent fingermarks on non-porous surfaces such as glass, plastic etc. The method relies on the deposition of polymerized cyanoacrylate ester on residues of latent fingermarks. The method develops clear, stable, white colored fingerprints. However, several post-treatement procedures can be used to improve the contrast of developed prints. In addition to it, some pre-treatment procedures can also be used to develop aged latent fingermarks. It is an efficient, non-destrcutive and excellent procedure for developing latent fingermarks.

Fingerprints are one of the most valuable evidence due to their uniqueness. They are found on objects present at crime scene and are used to identify the suspect or criminal or link them to crime scene and weapon or object. Fingermarks are formed by sweat released from pores present on friction ridge skin of hands. Finger ridges contain large number of sweat pores. When the finger touches any surface, the sweat from these pores gets deposited in form of contours which are the mirror image of the ridge patterns. Since sweat is colorless in nature, its deposition on surface also produces colorless impressions and these impressions are called latent fingerprints.

CHAPTER II: LITERATURE REVIEW

O'Neill Spectrometry (2019) studied the cyanoacrylate fuming mechanism by matrix-assisted laser desorption/ionization mass spectrometry. Despite cyanoacrylate fuming being widely used in the forensic science field, its mechanism is not well understood. In this study, matrix-assisted laser desorption/ionization (MALDI) mass spectrometry is used to study latent fingerprints that have been cyanoacrylate fumed in an attempt to gain insight into the fuming mechanism. In the negative mode mass spectrometry data, four compounds related to the polymerization of cyanoacrylate are identified and their structures are determined from accurate mass and MS/MS. A mechanism is proposed for the formation of these compounds that are regarded as intermediates in the polymerization reaction. In addition, based on the fuming of standard endogenous compounds, we suggest that fatty acids and amino acids are the major catalytic nucleophiles that initiate the polymerization reactions.

Sarah J. Field house (2011) investigated the use of a Portable Cyanoacrylate Fuming System (SUPER fume®) and Aluminium Powder for the Development of Latent Finger marks**.** In this study, the effectiveness of cyanoacrylate fuming using the SUPER fume® weeks, was investigated. Five thousand and four hundred latent finger marks were deposited under controlled conditions and graded. The results suggested that cyanoacrylate fuming (SUPER fume and dusting with aluminium powder for latent finger mark development on several nonporous surfaces, stored in various temperature environments for time periods up to 52 weeks of storage using both techniques. It was more effective at developing latent finger marks on textured and smooth plastic surfaces and for marks stored in temperatures of 37°C, whereas aluminium powder was more effective on glass, enamelled metal paint, and varnished wood, and for storage temperatures below 20°C. There were no significant benefits to using either technique for marks older than 24 weeks.

Emily Sonnexet.al (2016) studied the enhancement of Latent Fingerprints on Fabric Using the Cyanoacrylate Fuming Method followed by Infrared Spectral Mapping. A method has been developed for the visualization of latent fingerprints on fabrics, which is based upon cyanoacrylate (superglue) fuming followed by imaging using an infrared microscope. Results show that imaging on smooth, shiny fabrics such as polyester, silk, nylon, and acetate of different colours and patterns can give an improvement over existing enhancement methods. Results for cotton and polycotton were less successful and it is thought this may be due a combination of the presence of the carbonyl functional group in these fabrics as well as their absorbency to fingerprint sweat. The carbonyl peak (1700 cm^{-1}) provided the optimum spectroscopic feature to map and image a fingerprint. Comparisons between infrared mapping at a specific frequency range and principal component analysis showed that improved imaging was obtained with principal component analysis.

Roberta Risoluti et.al (2019) updated procedures in forensic chemistry: One step cyanoacrylate method to develop latent fingermarks and subsequent DNA profiling. In this experiment a detailed comparative examination between conventional, two steps process (cyanoacrylate fuming followed by staining with Basic Yellow 40) and Lumicyano is proposed for fingerprints detection, in cooperation with the Scientific Investigation Department (Carabinieri-RIS) of Rome. The study has been conducted on fresh and aged fingermarks (up to 100 days) and applied to non-porous surfaces without changing the fuming chamber settings of forensic laboratories. Fingermarks has been detected with UV Reflection (λ254) using SceneScope RUVIS instrumentation; furthermore, marks have been observed under white light and in fluorescence (λ415 e λ515) with crimescope system in order to ensure a good compatibility with the forensic light sources available within most police forces. The Lumicyano fluorescence decay was also evaluated up to 20 days. The possibility of further DNA detection after marks visualization, has also been investigated to propose a novel approach able to detect fingermarks and DNA from the same forensic trace. Furthermore, NMR analysis was performed to get some information about the interaction between the ethyl-2-polycyanoacrylate and 3-chloro-6- ethoxy-1,2,4,5-tetrazine (Lumicyano post fumigation) as well as to understand whether the fluorophore binds covalently the polymer formed on the ridges

Stephen P. Wargacki et.al (2007) studied the Chemistry of the Development of Latent Fingerprints by Superglue Fuming. In this study, the polymerization of ethyl-cyanoacrylate vapor by sodium lactate or alanine solutions, two of the major components in fingerprint residue, has been examined by monitoring the time dependence of the mass uptake and resultant polymer molecular weight characteristics. This data provided insight into the molecular level actions in the efficient development of latent fingerprints by superglue fuming. The results showed that the carboxylate moiety is the primary initiator of the polymerization process and that a basic environment inhibits chain termination while an acidic environment promotes it. The results also indicated that water cannot be the primary initiator in this forensic technique.

Stephen P. Wargacki et.al (2008) studied enhancing the Quality of Aged Latent Fingerprints Developed by Superglue Fuming: Loss and Replenishment of Initiator. In this study, examination of the aging process and how the changes that occur to a fingerprint residue over time influence the growth of polymer during development and also identified the loss of initiator by erosion and degradation that, when coupled with a loss of water from the print residue, result in a decreased ability to polymerize ethyl cyanoacrylate. Then presented the methodology by which the ability of aged latent fingerprints to polymerize ethyl cyanoacrylate is recovered. Two print enhancement agents, acetic acid and ammonia, are demonstrated to improve the growth of polymer from the print ridges by over an order of magnitude, while retaining the integrity of the print structure. Comparison between the two enhancement agents indicate that the enhancement occurs due to ridge coating by the ammonia or acetic acid and pH control of the latent print.

Calum Jonesa et.al (2018) studiedan assessment of a portable cyanoacrylate fuming system (LumiFume™) for the development of latent finger marks. The first phase of the study compared the LumiFume™ system with traditional cabinet fuming and black/white powder suspension for the development of latent fingermarks on a variety of surfaces (glass, plastic bin bag, laminated wood and tile) by means of depletion series' from 10 donors and four ageing periods (1, 7, 14 and 28 days). The portable fuming system provided superior quality of developed marks on glass and laminated wood whereas powder suspension was better on bin bags and all three techniques were comparable on tile. A decrease in mark quality was recorded from 1 to 14 days for the fuming techniques before an increase at 28 days. Lumicyano™ fluorescence stability studies over a 28 day period by means of depletion series' on glass slides and plastic bin bags revealed better quality marks for the portable system LumiFume™; however, storing marks under light conditions expedited deterioration for both systems. All marks developed with Lumicyano™ were subsequently treated with BY40 resulting in further improvement in mark quality for all substrates and ageing periods, with the exception of laminated wood which absorbed the fluorescent stain reducing the contrast in the process. The second phase of the study consisted of a pseudo-operational trial on 300 various substrates (e.g. glass bottles, aluminium cans, plastic bags) recovered from recycling bins. LumiFume™ and Lumicyano™ yielded 1469 marks whereas Lumicyano™ cabinet fuming and powder suspension yielded 1026 and 641 marks respectively. Similar to the first phase of the study, further treatment of the Lumicyano™ treated marks with BY40 resulted in further quality improvement as well as additional new marks. The LumiFume™ system produced results at least equivalent to the traditional cabinet fuming with Lumicyano™ highlighting its potential for implementation into casework to process crime scenes.

M. Paine et.al (2011) Research has been conducted to establish the effect that changes in relative humidity have on both the effectiveness of the cyanoacrylate fuming technique and the microstructures formed by the polymerisation reaction during the development of the marks. The study investigated ‘natural’ fingermarks and deliberately groomed eccrine and sebaceous marks, all exposed to relative humidity levels in the range 60–100%. It was found that the optimum level of relative humidity for the development of the most high quality marks is approximately 80%, in accord with current recommendations for operational implementation which are based on previous unpublished work. The eccrine constituents of the fingerprints are most influenced by humidity changes. Three humidity regimes were identified; each was giving different polycyanoacrylate microstructures. Humidity levels of 60% give flat, film-like structures whereas in the range 70–90% the characteristic noodle-like structure is formed. At higher humidities, thin, flat thread-like growth is observed with some ‘collapsed sphere’ structures observed close to pores and significant background development. The noodle-like structures are thought to scatter more light and retain fluorescent dye better than the structures formed at other humidity levels. Sebaceous marks produce a very different polymer microstructure, resembling a flat film with some fine nodular structures.

Sarah JaneGardner et.al (2016) studied on 'An investigation into effective methodologies for latent fingerprint enhancement on items recovered from fire'.This study presents a comparative evaluation of soot removal and fingerprint enhancement techniques, following fire(s) to ascertain optimal process efficacy for recovering fingerprints. Two car burns and a cremation oven were used to determine the temperature range. Temperatures of 300, 450 and 600 °C were used in simulated, controlled fires wherein cars had prints deposited on rear view mirrors. Burning occurred in a shipping container designed to approximate the variables relating to car arson. Soot removal was undertaken by tape lifting, sodium hydroxide solution, or liquid latex casting. The fingerprint enhancement techniques comprised black magnetic, aluminium and black suspension powders, or cyanoacrylate fuming with BY40 dye. A fingerprint expert classified prints as un/identifiable according to standards to be submitted as evidence in court. Multinomial logistic regression analyses were performed on the data using a p value of < 0.05 to determine statistical significance. Temperature was the biggest factor affecting fingerprint recovery. There were no statistically significant differences found between any of the soot removal methods used. Higher counts of identifiable prints were recovered with black magnetic powder and cyanoacrylate/BY40 compared to the other methods used but these findings were not statistically significant. It is recommended that recovery of fire-exposed fingerprints (which are not protected) is undertaken where suspected maximum temperatures are < 450 °C. Evaluation of optimal soot removal and fingerprint enhancement techniques should be conducted on a case by case basis.

CHAPTER III: AIM and OBJECTIVE

Aim

To study the influence of temperature in development of fingerprint by Cyanoacrylate fuming method

Objective

- To study the cyanoacrylate reactivity on heated fingerprints.

CHAPTER IV: MATERIALS AND METHODOLOGY

Materials Required:

Apparatus:

1. Glass slides
2. Cotton
3. Torch
4. Gloves
5. Thermometer

Chemical Required:

1. Cyanoacrylate (super glue)
2. Ethanol
3. Water

Instrument required:

1. Sisco Hot plate
2. Sirchie model No. FR600 Cyanoacrylate fuming chamber

Figure1: Cyanoacrylate Fuming Chamber

Figure 2: Hot Plate

Method:

In this study 45 latent fingerprints were collected on glass slides (non-porous surface). Out of 45 fingerprints 9 samples were kept on room temperature, other 9 samples were heated on 20 degree Celsius, 9 samples were heated on 50 degree Celsius, 9 samples were heated on 70 degree Celsius and remaining 9 samples were heated on 100 degree Celsius. Hot plate was used to heat the samples. These all the samples were heated for specific time period as out of 9 samples 3 samples were heated for 15 minutes, 3 samples for 30 minutes and 3 samples for 1 hour on all temperatures.

After heating on particular temperature for specific time period samples were kept in Cyanoacrylate Fuming Chamber for development of fingerprints. After keeping the samples in the chamber, cyanoacrylate glue was placed in one planchet and water was filled in another planchet. Then switched on the chamber and run it for 1 hour. After one hour removed the samples from cyanoacrylate chamber and observed the results. Fingerprints were developed in the form of white precipitated. Same procedure was followed for all the 45 samples.

CHAPTER V: OBSERVATIONS

- **Table 1: Room temperature -27 Degree Celsius for 15 minutes**

Sr.No.	Samples	Temperature	Time	Result
1	Sample 1	27	15 min	Fully developed
2	Sample 2	27	15 min	Fully developed
3	Sample 3	27	15 min	Fully developed

Figure 3: Fully developed fingerprint

- **Table 2: Room temperature-27 degree Celsius**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	27	30 min	Fully developed
2	Sample 2	27	30 min	Fully developed
3	Sample 3	27	30 min	Fully developed

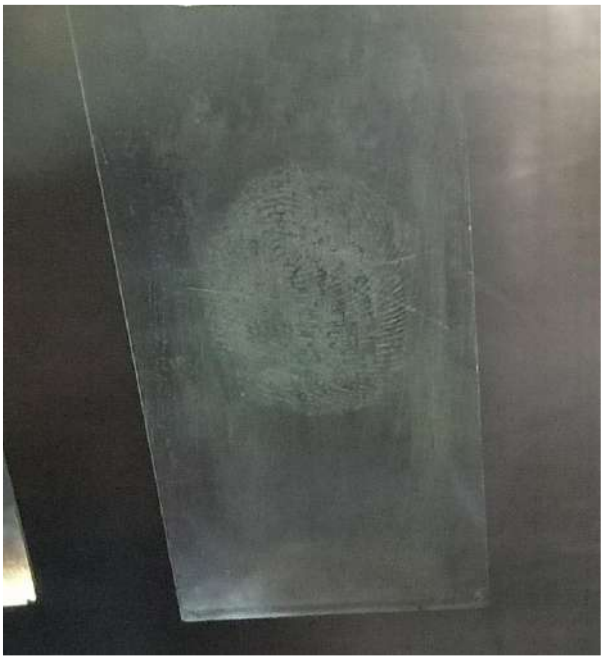

Figure 4: Fully developed fingerprint

- **Table 3: Room temperature-27 degree Celsius**

Sr.no	Samples	Temperature	Time	Result
1	Sample1	27	1 hour	Fully developed
2	Sample 2	27	1 hour	Fully developed
3	Sample 3	27	1 hour	Fully developed

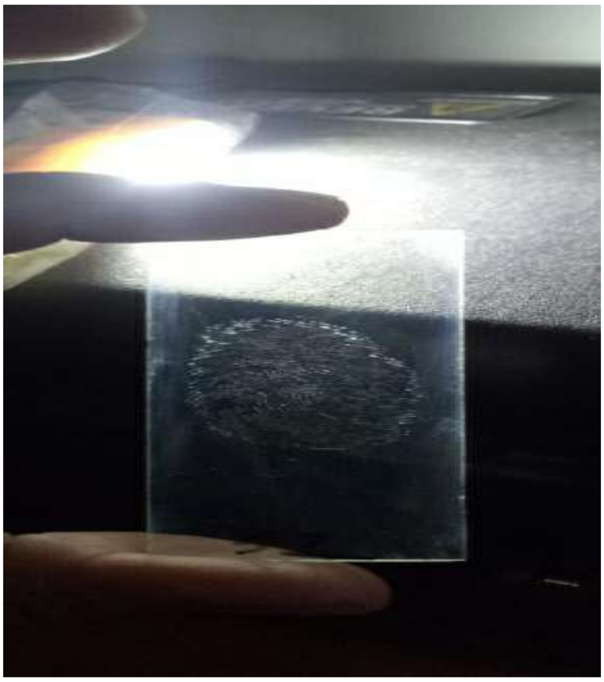

Figure 5: Fully developed fingerprint

- **Table 4: Temperature 20 degree Celsius for 15 min**

Sr.no	Samples	Temperature	Time	Result
1	Samples 1	20	15 min	Fully developed
2	Samples 2	20	15 min	Fully developed
3	Samples 3	20	15 min	Fully developed

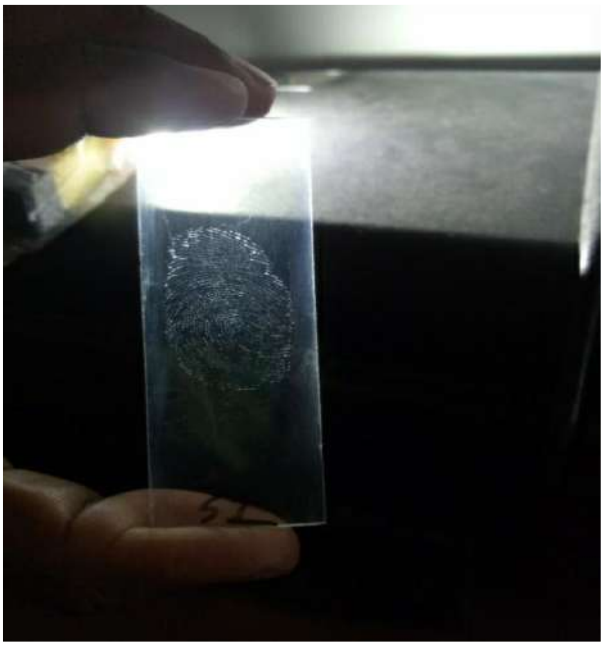

Figure 6: Fully developed fingerprint

- **Table 5: Temperature 20 degree Celsius for 30 min**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	20	30 min	Fully developed
2	Sample 2	20	30 min	Fully developed
3	Sample 3	20	30 min	Fully developed

Figure 7: Fully developed Fingerprint

- **<u>Table 6: Temperature: 20 degree Celsius for 1 hour</u>**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	20	1 hour	Fully developed
2	Sample 2	20	1 hour	Fully developed
3	Sample 3	20	1 hour	Fully developed

Figure 8: Fully Developed Fingerprint

- **<u>Table 7: Temperature: 50 degree Celsius for 15 minutes</u>**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	50	15 min	Fully developed
2	Sample 2	50	15 min	Fully developed
3	Sample 3	50	15 min	Fully developed

Figure 9: Fully developed Fingerprint

- **<u>Table 8: Temperature: 50degree Celsius for 30 min</u>**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	50	30 min	Fully developed
2	Sample 2	50	30 min	Fully developed
3	Sample 2	50	30 min	Fully developed

Figure 9: Fully developed Fingerprint

- **<u>Table 9: Temperature: 50 degree Celsius for 1 hour</u>**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	50	1 hour	Fully developed
2	Sample 2	50	1 hour	Fully developed
3	Sample 3	50	1 hour	Fully developed

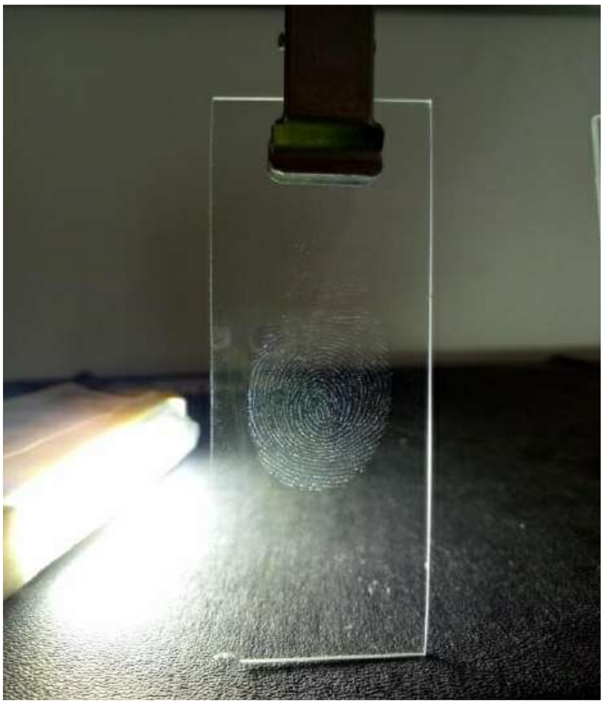

Figure 10: Fully developed Fingerprint

- **Table 10: Temperature 70 degree Celsius for 15 min**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	70	15 min	Fully developed
2	Sample 2	70	15 min	Fully developed
3	Sample 3	70	15 min	Fully developed

Figure 11: Fully developed Fingerprint

- **<u>Table 11: Temperature: 70 degree Celsius for 30 min</u>**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	70	30 min	Partially developed
2	Sample 2	70	30 min	Partially developed
3	Sample 3	70	30 min	Partially developed

Figure 12: Partially developed Fingerprint

- **<u>Table 12: Temperature: 70 degree Celsius for 1 hour</u>**

Sr.no	Samples	Temperature	Time	Result
1	Samples 1	70	1 hour	Partially developed
2	Sample 2	70	1 hour	Partially developed
3	Samples 3	70	1 hour	Partially developed

Figure 13: Partially developed Fingerprints

- **Table 13: Temperature 100 degree Celsius for 15 min**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	100	15 min	Partially developed
2	Sample 2	100	15 min	Partially developed
3	Sample 3	100	15 min	Partially developed

Figure 14: Partially developed Fingerprints

- **<u>Table 14: Temperature 100 degree Celsius for 30 min</u>**

Sr.no	Samples	Temperature	Time	Result
1	Sample 1	100	30 min	Not developed
2	Sample 2	100	30 min	Not developed
3	Sample 3	100	30 min	Not developed

Figure 15: Not Developed Fingerprints

- **Table 15: Temperature100 degree Celsius-1 hour**

Sr.no	samples	Temperature	Time	Result
1	Sample 1	100	1 hour	Not developed
2	Sample 2	100	1 hour	Not developed
3	Sample 3	100	1 hour	Not developed

Figure 16: Not Developed Fingerprints

CHAPTER VI: RESULT AND CONCLUSION

RESULT

The fingerprints sample which were kept on room temperature, 20 degree Celsius and 50 degree Celsius for specific time periods such as 15 minutes, 30 minutes and 1 hour are developed fully. The fingerprints samples which were kept on 70 degree Celsius for specific time periods such as 15 minutes, 30 minutes and 1 hour are developed partially and fingerprints samples were kept on 100 degree Celsius for specific time periods such as 15 minutes are developed partially and for 30 minutes and 1 hour are not developed.

CONCLUSION:

In present study, fingerprint samples were heated on various temperatures were developed fully and partially. From this study it is concluded that temperature up to 50 degree Celsius is not affecting the development of fingerprint but the fingerprint samples were heated on 70 degree Celsius and 100 degree Celsius are affecting the development of fingerprints.

In future this study needs to continue on various surfaces other than glass with various temperature and time periods and by using various fingerprint development techniques.

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