Int. Jr. of Contemp. Res. in Multi.

OPEN OACCESS

Volume 4 Issue 3 [May- Jun] Year 2025



International Journal of Contemporary Research In Multidisciplinary

**Research Article** 

# A New Unconventional Powder Method for Development of Latent Fingerprints on Various Surfaces: Kaolin Clay

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## DOI: https://doi.org/10.5281/zenodo.15550013

Case Report Information ISSN No: 2583-7397 Received: 29-04-2025

## Abstract

Fingerprint development methods are one of the earliest techniques used in forensic science for identifying suspects, and they have been practiced for centuries. Fingerprints are one of the most important physical pieces of evidence. Fingerprints come in a variety of forms, including latent, plastic, and visible. The majority of the time, random fingerprint impressions are found at the site of a crime during a criminal investigation. Since these prints are usually undetectable, a variety of development techniques are needed. The powder dusting method of fingerprint development includes the use of a brush to apply fine powder to the impression of the print. Current research on fingerprint development uses Kaolin Clay as an alternative to expensive commercial powders. Kaolin Clay is cheap, safe, eco-friendly, and easy to find. It was tested on twenty-four carefully chosen surfaces due to its frequent presence at crime scenes.

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sted on	Upadhyay R. A New Unconventional Powder Method for Development of Latent Fingerprints on Various Surfaces: Kaolin Clay. Int J Contemp Res Multidiscip. 2025;4(3):232–234.
	Access this Article Online

www.multiarticlesjournal.com

**KEYWORDS:** Kaolin Clay, Crime Scene, Powder Method, Surface, Latent Print, Fingerprint.

## 1. INTRODUCTION

Finger or thumb prints are commonly found in civil and criminal cases as significant evidence. Every time a person touches, holds, or lifts an object, there's a greater than average chance that fingerprints will be transferred onto the touched surface(s). <sup>[1-3]</sup> Fingerprints have frequently been and still are considered one

of the precious types of impression evidence in identification. <sup>[4-5]</sup>. Fingerprint Characteristic is a form of biometrics, a method that uses people's physical characteristics to identify them. <sup>[6-8]</sup> Fingerprints can be classified as latent (invisible), visible, or plastic prints. Finding a plastic or visible print at a crime scene is relatively easy because they are usually visible to the naked eye.

Identifying latent or invisible fingerprints is much more difficult and requires the use of appropriate visualization techniques and/or development techniques. [9] There are several ways to visualize latent prints, depending on the surface being examined, ease of application, effectiveness, and efficiency, as well as safety and health considerations. <sup>[10-12]</sup>

Kaolin is primarily composed of the mineral kaolinite. Depending on the source, kaolin is also composed of other minerals such as muscovite, quartz, feldspar, and anatase. When kaolin is extracted from the earth, it is naturally bright white. However, due to exposure to iron oxide, it may develop a yellow or rust coloration. Kaolin is naturally available as a powder and has a soft texture. The chemical formula of kaolin in its natural mineral state is Al<sub>2</sub>Si(O<sub>5</sub>)(OH)<sub>4</sub>. Kaolin is a silicate mineral of aluminum. It is formed by the chemical weathering of aluminumrich feldspars in granites or pegmatites. Kaolin is composed of hexagonal crystals that are between 0.1 and 10 micrometers in size. These crystals form into stacked layers. This kaolinite structure is one of the reasons why the clay has its desired properties. Because of the chemical and structural properties of kaolin, its natural characteristics are highly desired for industrial applications. The pH level of Kaolin is neutral, making it ideal for use in pharmaceuticals, cosmetics, and industrial mixtures, as it does not change the chemical composition of the product or promote bacterial growth. One of the main uses of kaolin clay is to promote the adsorption of other substances. Kaolin clay is naturally very absorbent, so it helps draw out and remove unwanted contaminants, pathogens or other substances in any mixture or application.

## 2. METHODOLOGY

Latent test prints were collected from subjects using pure sweat. To collect pure sweat samples, each subject was asked to wash their hands thoroughly with soap and water. Then, after drying the hands, the palms were closed and sweated. Next, subjects were asked to place latent fingerprints on various substrates. When collecting pure sweat samples, care was taken not to touch anything between washing hands and applying the print to the substrate. Although brushing powder into the print is a quick and straightforward method, there are drawbacks that occur when the brush comes into touch with the powder. The ridge features are eliminated when the surface with the print destroys the print. A few grams of Kaolin Clay that was commercially available were taken in the current study in order to help develop latent fingerprints. The powder was then further ground in a blender to a very fine powder that was comparable to talcum powder, but no particle size was measured. The tests were carried out for months In April-May, when the temperature was 35-42 C and relative humidity 60-80%. The powder is sprinkled on the surface and then the excess powder is removed touch for a clear printout. So, you can check Kaolin Clay was used in the comparative evaluation for porous and non-porous surfaces. Types of surfaces used in this study are - coloured glass surface, transparent glass surface, multi-coloured surface, plastic surface, aluminium surface, wood surface and rough surface.

#### 3. **RESULTS**



**Fig 1:** Fingerprint on Coloured Glass **Fig 2:** Fingerprint on Glass surface



Fig 3: Fingerprint on Multicoloured surface Fig 4: Fingerprint on a Plastic surface



Fig 5: Fingerprint on Aluminium surface Fig 6: Fingerprint on a Wooden surface



Fig 7: Fingerprint on Leather surface Fig 8: Fingerprint on Rough Surface

The results of latent fingerprint formation with kaolin clay on 8 different surfaces are shown in Figures. 1-8 Most surfaces have hidden fingerprints studied can be successfully developed with kaolin clay. Comparative evaluation of different surfaces with it powders shows that it gives better results on Glass surface, Multicoloured surface, Aluminium surface and Wooden surface, can be done successfully and gives a clear edge as shown in the pictures and on Leather surface and rough surface the prints are not that clear in the pictures. The Kaolin clay can be used to identity in case of theft. It has been suggested that the power of kaolin clay can be used for visualization fingerprints, on different surfaces especially on smooth surfaces. These results suggest that kaolin clay can be used successfully powder on most surfaces except leather and rough surfaces.

The outcomes obtained in the current study Research also demonstrates that the formation of fingerprints is contingent upon the kind of powder that was used and the surface on which the fingerprints were found also shows up in latent prints left behind by perspiration. It's a physical technique for improving latent prints, and deals with the mechanical adherence of the fingerprint powder particles to the oily components of the skin ridge deposits.

### 4. **DISCUSSION**

The current research demonstrates that decoding prints depends on the kind of prints left behind surfaces on the prints, as well as the chemicals utilized for the, are also included. print development. These first findings suggest that latent fingerprints may also be visualized using the common substances on a variety of materials. Additional research in terms of stability and development of prints it must be conducted. These results are anticipated to be beneficial. These agents, which are more affordable and easily accessible, can be a helpful replacement.

### 5. CONCLUSION

Based on this study, it is concluded that these generally and readily available and cheaper substances (kaolin clay) could be a useful substitute for the interpretation of latent impressions deposited on various surfaces.

## 6. FUNDING

None.

## 7. CONFLICT OF INTEREST

None declared.

### 8. ACKNOWLEDGEMENTS

I am very thankful to everyone who gave their sample for this research, and especially Dr Abhideep Tiwari for his support and motivation.

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