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ORIGINAL ARTICLE

Visualization of latent fingerprints using silica gel G: A new technique

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Powder method;
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Abstract There are various methods available for the development of latent fingerprints on different substrates. 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.

1. Introduction

In forensic investigations, fingerprints are considered a very valuable type of physical evidence. Fingerprints are found in majority of the crime scenes. The latent fingerprints, deposited by the ridges of the finger or palm are a complex mixture of natural secretions and contaminants from the environment. Three types of glands are responsible for the natural secretions of the skin: the sudoriferous eccrine, apocrine glands, and the sebaceous glands. These three types of glands have well-defined functions, and the composition of their secretions varies in consequence. The sudoriferous glands are distributed all over the body and produce sweat that consists of more than 98% water.[1] The composition of latent print residue includes: chloride, calcium, sulphur, urea, lactic acid, amino acids, phenol, sodium, potassium, and ammonia, cholesterol, free fatty acids, wax esters with diglycerides, triglycerides, etc.[2] The development and visualization of latent fingerprints on some unusual substrates have remained a challenge to forensic scientists. Various methods are available to develop the latent fingerprints in the literature. Recently the hydrophobic silica based particles had been developed to visualise latent fingerprints.[3] However the traditional method for developing the fingerprints is the powdering method.[4] In this study a new material (powder) has been identified which can be used for the development of latent fingerprints present on both nonporous and porous substrates. In this work silica gel G powder, that is used to prepare the thin layer chromatography (TLC) plates, is used. This powder is easily available for the laboratory work.

Silica gel G powder is a form of silicon dioxide (silica) with the binder gypsum. The silicon atoms are joined via oxygen

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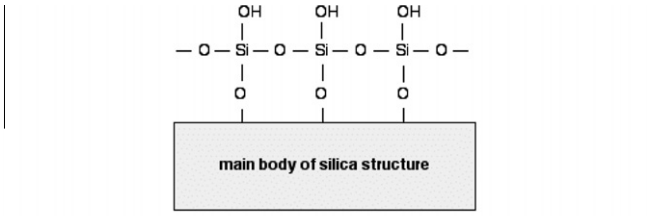
atoms in a giant covalent structure. At the surface of the silica gel, the silicon atoms are joined to –OH groups. This diagram shows a small part of the silica surface.[5]



The diagrammatic representation of small part of silica surface

The surface of the silica gel is very polar and, because of the –OH groups, can form hydrogen bonds with suitable compounds around it as well as vander Waals dispersion forces and dipole–dipole attractions.[5] In addition to these different studies have been reported by various workers.[6–17]

Silica gel G powder has not been reported as a single developing powder for fingerprints while some communications exist on the application of silica gel G as a carrier.[18] It is therefore thought to undertake the present investigation and it is expected that it will provide useful information to the fingerprint experts.

2. Materials and methods

The latent fingerprints were collected on fifteen different substrates which include porous as well as non-porous surfaces. The latent fingerprints were deposited on various substrates as mentioned below and it was made sure that the subject was heavily sweating while depositing the fingerprints even in winters under laboratory conditions and all the 10 fingers were employed for taking the prints. During depositing of fingerprints, donors and substrates uniformity was maintained. The non-porous substrates used in this work are plastic (bottle plastic, transparency sheet, and gift wrapping

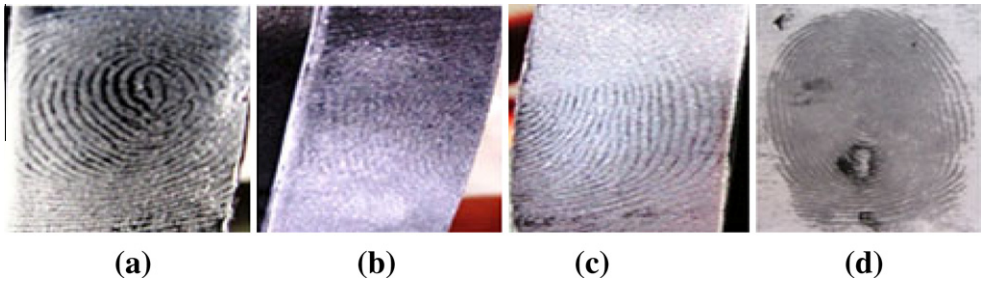


Figure 1 Showing comparative visualization of latent fingerprints on plastic surface with silica gel G powder (a) white powder (b) light grey powder (c) black powder (d).

Figure 2 Showing comparative visualization of latent fingerprints on glass surface with silica gel G powder (a) white powder (b) light grey powder (c) black powder (d).

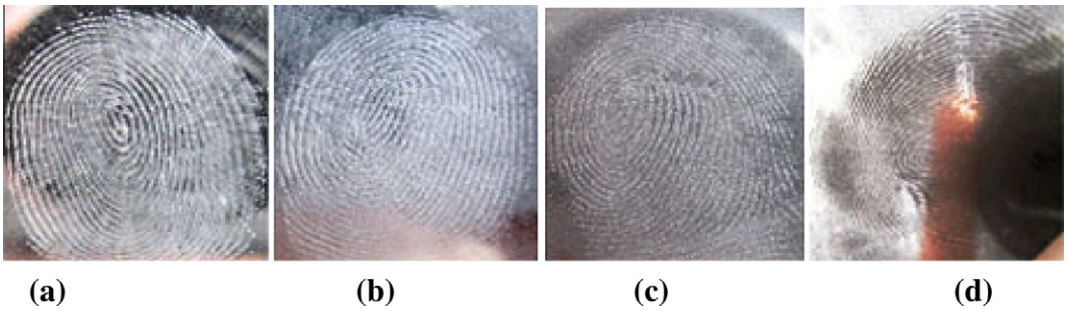


Figure 3 Showing comparative visualization of latent fingerprints on ordinary mirror with silica gel G powder (a) white powder (b) light grey powder (c) black powder (d).