DOI:10.7598/cst2015.1051
ISSN:2278-3458

Chemical Science Transactions
2015, **4(4),** 1043-1046

RESEARCH ARTICLE

The Study of Fluorescent Chemicals for Fingerprint Development

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Received 23 March 2015 / Accepted 18 April 2015

Abstract: The recovery of fingerprints from a crime scene is an important method of forensic science. The development of fluorescence chemicals in the detection of latent fingerprints on a non-porous surface has been studied. The aromatic chemicals, anthracene and naphthalene have been used. The UV light at a wavelength of 365 nm was used as a detector. The fingerprint identification was confirmed by counting the minutiae using automated fingerprint identification system (AFIS). The results showed good sensitivities on only anthracene. The effect of temperature to the fingerprints appearance was also studied. The latent fingerprint which was developed by anthracene was disappeared at temperature more than 100 ^{o}C.

Keywords; Anthracene, Naphthalene, Fingerprints, Fluorescence chemicals

Introduction

Fingerprints are useful evidences and essential for establishing identity in criminal investigations. The detection and subsequent development of fingerprints is thus necessary. Latent fingerprint development has been evolved with various methods in both physical and chemical processes during the past century. Thus, the fingerprint investigation techniques are continuously changing and it is necessary for those involved in laboratory and crime scene processing are well trained and practiced for their safety[1,2].

Latent prints are collected in almost every crime scene carries, however, they are not easily visible to naked eyes and need further processing. Powder methods are most common to develop latent fingerprints. But sometimes this method fails to develop smudged, old prints on different surfaces. Nanotechnology is the most trending technology all over the world and such technology can be used to enhance the development of fingerprints[3-4].

This study is an effort to overcome this difficulty by means of fluorescent chemicals. The purpose of this study is to develop fingerprints using fluorescent chemicals on several materials under control of environmental conditions.

Experimental

Latent fingerprint development was selected to develop into two type of non porous surfaces material namely CD (Polystyrene) and glass slide. Materials were prepared 20x20 cm sheet A Cannon EOS 100 D ISO 200 with Macro Lens EF 100 mm 1:2:8 digital camera (made in Japan) was used to photographed the images.

Chemical preparation

Analytical grade chemicals anthracene and naphthalene were selected and kept its dry under temperature 40 °C. This makes it more stable before use. After drying, the size of the anthracene and naphthalene particles was milled by using an agate mortar–pestle. The anthracene and naphthalene particles were then stored in inert glass vials.

Application of Anthracene particles on material surfaces

About 10 mg of anthracene and naphthalene particles were sprinkled on the surface containing fingerprint. The particles were rotated clockwise. After five minutes in the same manner the particles were removed from the surface. The surface was left without any post treatment and the necessary photographs were taken.

The study of temperatures effect

The Anthracene particles were sprinkled on the glass surface containing fingerprint and left in oven with temperatures 40, 60, 80 and 100 ^{o}C. Detection of fingerprints were carried out using UV 254 and 365 nm.

Detection of Latent fingerprint

The fluorescent detection was observed under Docucenter Expert (PIA-6000) - Projectina Ltd. (Switzerland) in the details below.

A light source which is used in forensic document examination is a multi light including 365 nm light that can be detected fluorescent of anthracene and naphthalene chemicals. It used a strong light source and a monochromatic lamp to generate illumination of variable narrow ranges of wavelengths. It was detected the differences in luminescence of inks that are dependent on a variations of the wavelength of the exciting light. 365 nm of wavelength was selected for this study. Software PIA-6000 Unique was used as the system for optical features, resolution and magnification range and extended field of view. High resolution IR digital colour camera and colour IR digital camera with high IR sensibility, spectral range 350 nm - 1000 nm, integration up to 12 seconds for weak luminescences, predefined camera parameters for individual selection of light were selected. Optics/Magnification 16x Zoom objective, motorized, autofocus, magnification range from 2x up to 95x on 21“ TFT monitor, monitor resolution 1600x1200 pixel were selected in this operation.

Results and Discussion

When the anthracene and naphthalene particles were sprinkled on each surface and mild rotation was given the print appears in a fraction of seconds. Latent prints present on surface materials in differences detective light sources (Figures 1–3).

The study of the effect of temperatures was carried out using glass surface. After sprinkled an anthracene particles on glass surfaces that contained fingerprint, the samples were left in oven with temperatures 40, 60, 80 and 100 ^{o}C for 1 h. After detection of fingerprints using UV 254 and 365 nm, the results show in Figure 4.

Figure 1. Showing latent fingerprint on CD using anthracene powder (a) white light (b) black light (c), (d) and (e) under UV256, UV365 and white light from Docucenter Expert (PIA-6000) respectively

Figure 2. Showing latent fingerprint on glass slide using Anthracene powder (a) white light (b) black light (c), (d) and (e) under UV256, UV365 and white light from Docucenter Expert (PIA-6000) respectively

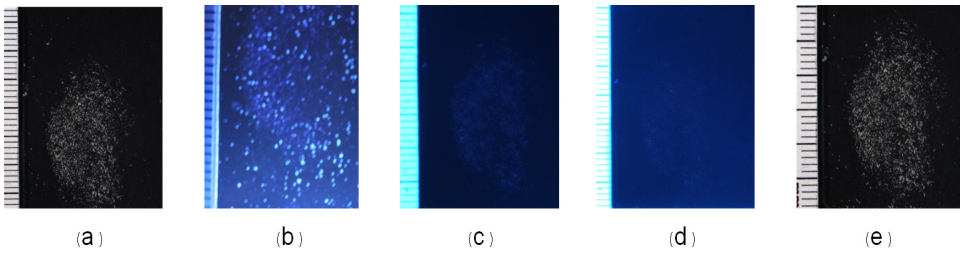

Figure 3. Showing latent fingerprint on glass slide using Naphthalene powder (a) white light (b) black light (c), (d) and (e) under UV256 nm, UV365 nm and white light from Docucenter Expert (PIA-6000) respectively

Interestingly developed prints remain undisturbed in different materials, however only naphthalene in several detective light sources seems to be unclear. The photographs show prints kept in three different environments. The advantage of this technique is that it needs only dry powder of anthracene and naphthalene for development. Not much powder is needed. Need brush strokes required. No need of carrying the fingerprint kit and useful in dark scene. The developed powder last for long time and above all prints present on non porous surface materials

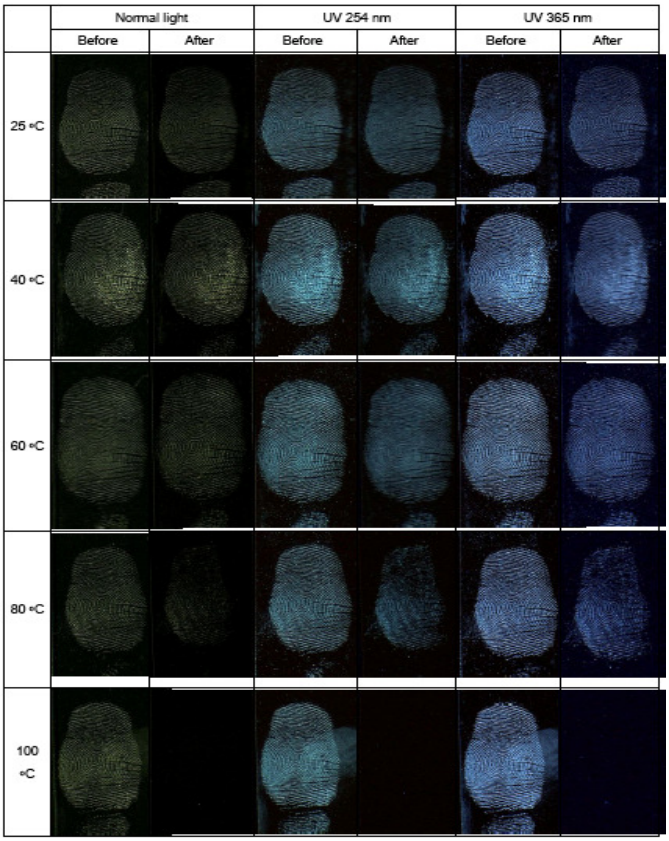

Figure 4. Showing latent fingerprint on glass slide using anthracene powder after left in oven for 1 h with 25, 40, 60, 80 and 100 ^{o}C respectively

Conclusion

Anthracene and naphthalene show a great response towards developing latent fingerprints. The greater ability of developing powder on different surfaces gives anthracene and naphthalene a different and unique approach in the field of forensic science. The prints developed by Anthracene shown more clear than Naphthalene in every surfaces in this study. This gives rise to an idea of developing prints by using fluorescent chemicals, anthracene and naphthalene in future. Anthracene powder has great affinity towards the development of prints and they are stable up. So the use of anthracene powder is easier and gives better result than naphthalene powder.

Acknowledgement

The authors are grateful to the Chemistry Department of Silpakorn University for Chemical facilities.

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