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Developing Latent Fingerprints on Wet Surfaces with a Fluorescent Schiff's Base as SPR

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ABSTRACT

The fingerprints left by the perpetrators are the first thing a forensic team searches for during a crime investigation. These prints could be visible or hidden (also known as latent). The development of these latent fingerprints on various surfaces is done using a variety of approaches. An important and useful method, most commonly used in forensic investigations for wet surfaces involves Small Particle Reagent method. In present work, we report the use of a UV fluorescent Schiff's base as an effective organic compound which has been employed as a small particle reagent. It has been used for the visualisation of latent finger prints on various non-absorbent surfaces. The advantage of employing this Schiff's base as a small particle reagent over previously utilised dyes is that it is less expensive, contains no heavy metal, and may be used on a variety of surfaces. Furthermore, while taking images, visualisation does not necessitate the use of a particular UV lamp or filter.

KEYWORDS: *Latent fingerprints, Powder technique, Small Particle Reagent, Schiff's base, UV fluorescence*

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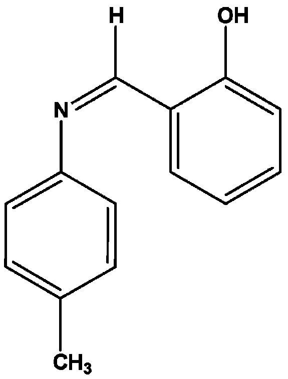
INTRODUCTION

Finger or foot prints collected at a crime scene are a well-known category of physical evidences that can help solve a case. The fact that each person's finger prints are unique has been proven, and the courts have accepted this fact as evidence. Fingerprints left by a criminal can sometimes be seen with the naked eye. Such prints are made on the blood stains or any paint etc or by the hands soiled with blood on other things. When the finger prints are not visible to the human eye which are generated by the deposits of perspiration on a surface, they are referred to as latent fingerprints[1,2]. Different chemical reagents can selectively fix the elements of sweat, allowing the latent finger prints to be seen[3].

The powder technique, which includes applying a finely grounded formulation to the finger mark impression[4], is the simplest for detecting latent fingerprints. However, this powder approach does not work on damp surfaces. A situation like this emerges when the perpetrator tries to wash the object or throws the weapon, like a knife or pistol, into a water body. The small particle reagent (SPR) approach has been proven to be highly useful for identifying finger impressions on damp or wet surfaces. This approach works because fine reagent particles stick to the oily or fatty components of latent finger mark residues. This process has been used to generate finger marks on variety of surfaces including plastic, wood, vinyl, glass and metal that have been immersed in water for an extended period of time. In another investigation, latent finger marks were developed on the writing surface of various types of rewriteable and recordable compact discs using a fluorescent SPR mixture containing basic zinc carbonate, eosin Y dye, and commercial liquid detergent [5]. SPR composition consisting of basic zinc carbonate and eosin B has also been used to develop latent finger marks on different kinds of non-porous surfaces [6]. We recently reported the use of a UV fluorescent Schiff's base, 2-(4-methylphenylimino) methylphenol(I)[7,8] in forensic applications. The results of its utility as powder fingerprint formulations were quite encouraging. In this communication, we provide our findings, which show that this compound (I) can also be utilised as a small particle reagent to develop finger prints on wet surfaces or on products that have been dipped in water where powder method cannot be used. Various objects have been used during present study in order to test the applicability of the Schiff's base (**I**) as SPR for development of latent fingerprints on different type of non-absorbent surfaces. The observations have been made on various non-absorbent reflective objects viz., aluminium foil, chrome plated spatula, stainless steel spoon, glass plate and a plastic sheet.



I

Method and material

The Schiff's base (**I**) was prepared by the procedure described in our earlier work[8].

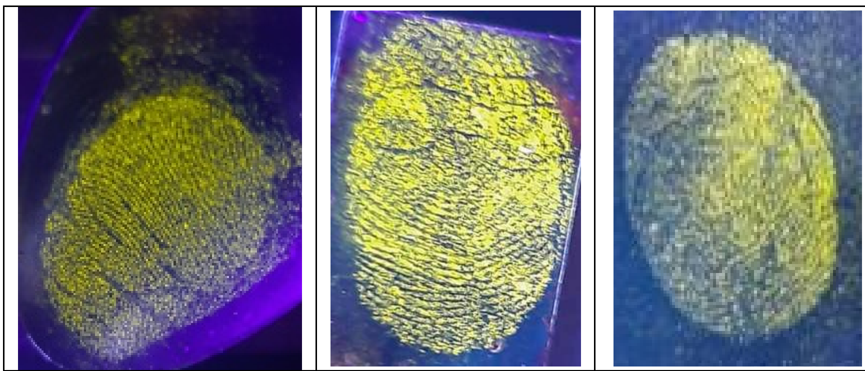
Preparation of Small Particle Reagent: 50 mL of distilled water was taken in a 250 mL beaker and 5g of basic zinc carbonate was added to it. Then 25 mg of finely grounded Schiff's base was added to it followed by the addition of 0.1 mL of a commercial liquid detergent. It was stirred thoroughly with the help of a magnetic stirrer when a yellow-coloured homogeneous mixture was obtained.

The finger marks were taken on five objects of each category and then dipped in water. These objects were taken out after a period of five minutes, one hour, six hours, one day and two days. These were dipped in the reagent, so prepared, for about 10 minutes in each case. Following that, these objects were removed, washed with water to eliminate excess reagent, dried, and the marks examined under a standard UV lamp. The presence of yellow luminous finger prints was observed and photographed without the use of any filters.

Preparation of 2-[(4-methylphenyl-imino) methyl]phenol (**I**) : 1.07g(0.01 mol) of 4-methylaniline was dissolved in 2.5 mL of ethanol, taken in a china dish and then 1.22g (1.05 mL, 0.01 mol) of salicylaldehyde was added to it with constant mixing . A yellow solid separated within two minutes. It was further mixed for another five minutes and then crystallized from alcohol to give yellow needle shaped crystals. Melting point of the compound was found to be 100-101°C (Lit.[9] m.pt. 100-101 °C).

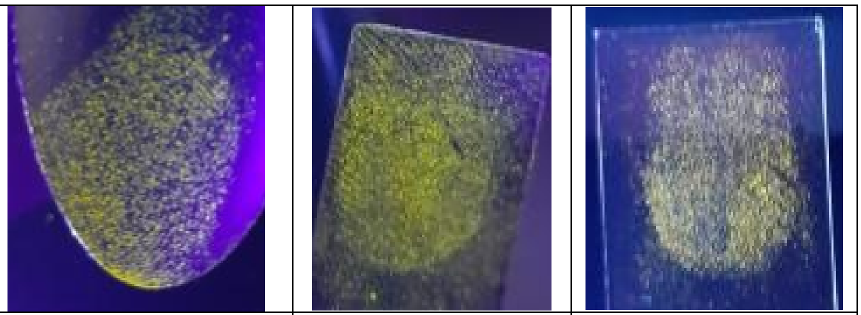
Results and discussion

The results can be seen in the following photographs, on a stainless-steel spoon (a), a chrome plated spatula (b) and a glass slide (c). Figures 1, 2, and 3 demonstrate the outcomes of dipping these objects in water for 5 minutes, 1 day, and 2 days, respectively. It has been observed that better results showing less smudging and clear ridge details are obtained when this SPR is used. Because of its fluorescence feature, this Schiff's base could even detect weak latent fingerprints, which increases its utility in casework investigations at the crime scene. The fingerprints developed by this method are sharp and clear. The fluorescent nature of the Schiff's base also enhances the visibility of the impressions to an appropriate degree. The method is easy to use and is cost-effective.



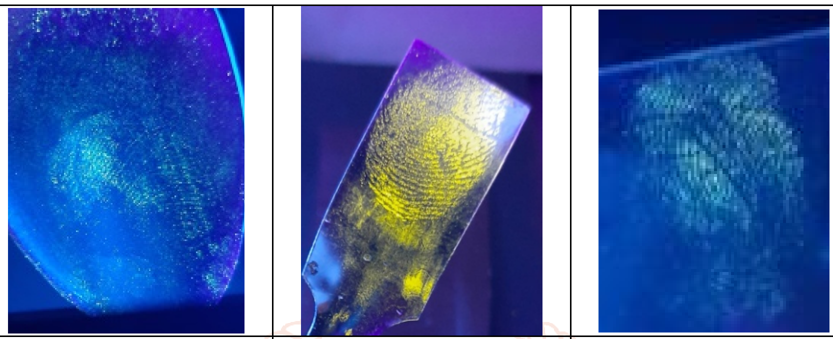
(a) (b) (c)

Fig.1 Finger prints after dipping the objects in water for 5 minutes



(a) (b) (c)

Fig.2 Finger prints after dipping the objects in water for 1 day



(a) (b) (c)

Fig.3 Finger prints after dipping the objects in water for 2 days

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