Defence Science Journal, Vol 50, No 2, April 2000, pp. 213-215

SHORT COMMUNICATION

Organic Fingerprint Powders Based on Fluorescent Phloxine B Dye

G.S. Sodhi and Jasjeet Kaur
University of Delhi, Delhi – 110 007

ABSTRACT

Novel fingerprint powders based on organic dye (phloxine B) have been prepared using insoluble salts as adhesive materials in place of costly resinous polymers (which most conventional powders incorporate). Sharp and clear prints have been developed on a wide range of surfaces, such as paper, plastic, glass, bakelite, enamelled metal and polished wood. The fluorescent nature of phloxine B assists in developing weak prints under ultraviolet light which can assist a forensic scientist for lifting fingerprints from the scene of crime and also a defence scientist for establishing the identity of deceased native soldiers as well as of prisoners of war.

1. INTRODUCTION

The application of finely divided materials and the subsequent removal of the excess powder by brushing and blowing or tapping has been the universal method of intensifying fingerprints on non-absorbent surfaces since the early days[1,2]. The technique relies on mechanical adherence of fingerprint powder to the moisture and oily components of skin-ridge deposits. Conventional fingerprint powders consist of a resinous polymer for adhesion and a colorant for contrast. Over the years, it became evident that powders containing toxic inorganic salts posed a health hazard[3]. As a result, the organic-based fingerprint powders have become more popular[4].

Besides its conventional utility in crime detection, fingerprint technology finds applications in areas related to defence[5]. The science of fingerprinting helps in establishing the identity of war victims whose bodies are badly mutilated. It also helps in the identification of prisoners of war who escape under disguise.

This communication reports a novel formulation for fingerprint dusting which contains a fluorescent organic dye (phloxine B) as shown in Fig. 1. For cost-effectiveness, the conventional and expensive resinous adhesives have been replaced by cheap and insoluble salts.

2. EXPERIMENTAL PROCEDURE

Di-sodium salt of phloxine B was procured from Aldrich Chemical Co., USA and used without further purification. The fingerprint powders contained a colorant phloxine B and an adhesive material (calcium fluoride, calcium carbonate, barium sulphate or zinc carbonate) in varying proportions. The critical composition of each formulation is given in Table 1.

Weighed quantity of di-sodium phloxine B was dissolved in a minimum quantity of water and poured over weighed amount of the adhesive material. The mixture was stirred vigorously and then allowed to dry at room temperature for 4-7 days. For every 1 g of the composition, 0.02 g of

Re-revised 17 November 1999

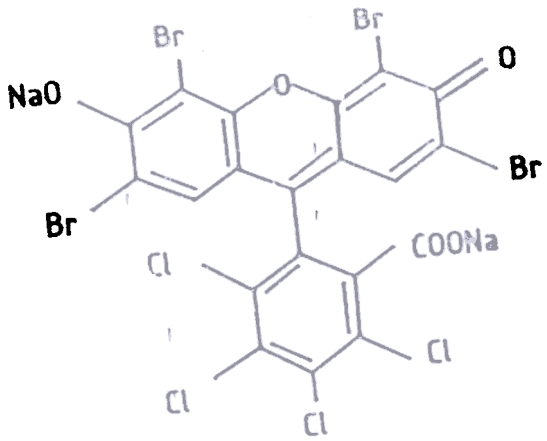

Figure 1. Structure of phloxine B

talc was added. The dried mass was ground to fine powder and then stored in a tight container.

The powder was applied with a camel hair brush to the surface impinged with the latent fingermark. The excess powder was dusted-off and prints photographed.

Table Optimum concentration of adhesive and phloxine B for different formulations

Adhesive material (% by weight)		Phloxine B (% by weight)
Calcium fluoride	38.0-38.2	61.8-62.0
Calcium carbonate	38.9-39.2	60.8-61.1
Barium sulphate	40.0-40.2	59.8-60.0
Zinc carbonate	38.3-38.5	61.5-61.7

3 RESULTS & DISCUSSION

The fingermarks developed using these formulations are sharp, clear and visible to the naked eye. These fingermarks can be developed on any light coloured paper except pink or red, where the contrast with the background is extremely low. In addition, prints can be lifted from currency notes. This is important because ninhydrin, one of the most common reagents for the development of latent fingerprints, gives a background reaction with melamine-coated currency notes, and its use is therefore precluded[6]. Good-quality prints have also been lifted from lamination sheets. Thus, the present method may be extended for obtaining fingerprints from laminated documents, such as

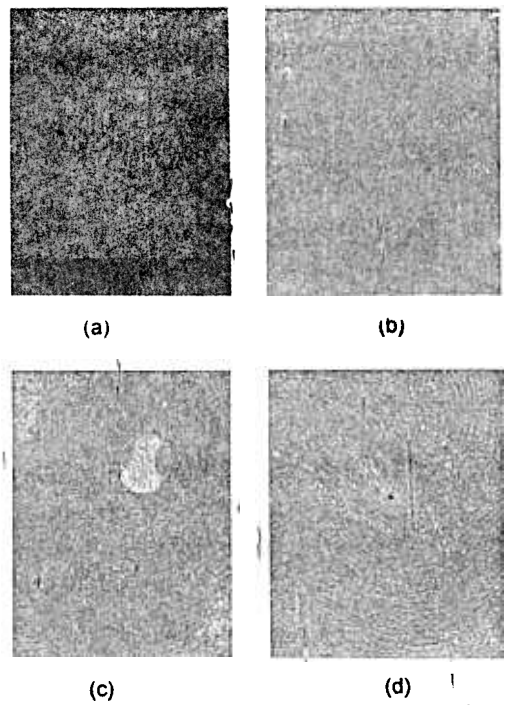

Figure 2. Fingerprints developed on: (a) paper (38% calcium fluoride, 62% phloxine B); (b) polythene (39% calcium carbonate, 61% phloxine B); (c) bakelite (40% barium sulphate, 60% phloxine B) and (d) glass (38.5% zinc carbonate, 61.5% phloxine B).

archeological scripts, certificates, driving licences and identity cards. Fingermarks have been visualised on obverse and waxed reverse sides of the postal stamps.

Prints can also be developed from polythene bags and polythene containers commonly used for carrying and storing household items. Normally, the neutron activation analysis technique has to be called into action for polythene surfaces[7]. Other surfaces on which an unscrupulous element is likely to leave its fingerprint impressions include: glassware, steel handles, knobs and almirahs, bakelite switches and switchboards, bonechina and porcelain crockery, polished furniture and enamelled utilities like cars, washing machines and refrigerators. The present formulations give good results on all these surfaces as shown in Fig. 2.

Phloxine B is a cheap, nontoxic dye which is readily available. It is used in cosmetics and also as a biological stain and an analytical reagent. Since

the dye is fluorescent in nature, the present formulations can be extended to the development of weak prints under ultraviolet light.

Most of the conventional dusting powders use costly polymeric adhesives like silica gel, rosin or starch but in the present formulations insoluble salts like calcium fluoride, calcium carbonate, barium sulphate or zinc carbonate have been used. These salts are cheaper than the conventional polymeric adhesives and their incorporation brings down the cost of formulation.

4. CONCLUSION

Fingerprint powders based on phloxine B are cheap, nontoxic, fluorescent formulations that can develop latent fingermarks on a wide range of non-absorbent surfaces.

REFERENCES

1. Wilshire, B. Advances in fingerprint detection. *Endeavour*, 1996, **20**, 12-15.

Chatterjee, S.K. & Finger, Palm. Sole prints, Ed.2. Kosa Publishers, Calcutta, 1967, pp. 88-103.

3. Lee, H.C. & Gaensslen, R.E. (Editors) Advances in fingerprint technology. Elsevier, New York, 1991. pp. 59-101.

4. Kerr, F.M.; Haque, F. & Westland, A.D. Organic-based powders for fingerprint detection on smooth surfaces. *Can. Soc. Forensic Sci. J.*, 1983, **16**, 140-42.

5. Lambourne, G. The fingerprint story. Harrap, London, 1984.

6. Lennard, C.J.; Margot, P.A.; Stoilovic, M. & Warrener, R.N. Synthesis of ninhydrin analogues and their application to fingerprint development: Preliminary results. *J. Forensic Sci. Soc.*, 1986, **26**, 323-28.

7. Knowles, A.M. Aspects of physicochemical methods for the detection of latent fingerprints. *J. Phys. E. Sci. Instrum.*, 1978, **11**, 713-21.

Contributors

Dr GS Sodhi is presently working as Reader in the Department of Chemistry, S.G.T.B. Khalsa College, University of Delhi. He was Visiting Fellow at the National Crime Records Bureau, Ministry of Home Affairs, New Delhi, during 1996-97.

Dr Jasjeet Kaur is the Head, Department of Instrumentation, College of Applied Sciences for Women, University of Delhi. She was awarded *Young Scientist Award* (1997) for her work in fingerprinting.