TECHNICAL NOTE

Yaron Shor,[1] *M.Sc.; Asya Vinokurov,*[1] *M.Sc.; and Baruch Glattstein,*[1] *M.Sc.*

The Use of an Adhesive Lifter and pH Indicator for the Removal and Enhancement of Shoeprints in Dust

REFERENCE: Shor Y, Vinokurov A, Glattstein B. The use of an adhesive lifter and pH indicator for the removal and enhancement of shoeprints in dust. J Forensic Sci 1998;43(1):182–184.

ABSTRACT: The use of a white adhesive lifter to remove footwear imprints in dust and their subsequent enhancement with a pH indicator is described. Two cases in which shoeprints were recovered using this method are presented. It was found that this method is superior to that of gel lifting.

KEYWORDS: forensic science, criminalistics, footwear imprints, adhesive lifter, pH indicator, enhancement

Not all footwear impressions located at a crime scene are clearly visible and distinct. Typical enhancement procedures that can render such two-dimensional impressions more visible may be divided into three types, namely, photographic, physical and chemical treatments. Physical methods employ techniques such as electrostatic, gelatin or adhesive lifting (1). These techniques can effectively enhance the visibility of an impression by transferring it on to an appropriate background and thus improving its contrast.

The general consensus on recovery order is to make an electrostatic lift on black lifting film which if not successful, is nondestructive, and would therefor not harm subsequent enhancement methods such as gelatin or adhesive lifting. It was found that the gelatin lifting is superior to the electrostatic lifting on smooth, nonporous surfaces (2). The lifting of footwear impressions in dust using a black gelatin lifter, usually, provides after photographic enhancement, much better contrast than the adhesive lifter (before chemical enhancement).

Chemical enhancement methods also increase in the contrast and visibility between the impression and the surface the impression is on. A comparatively simple method for enhancing shoeprints retained in dust using the pH indicator Bromo-Phenol Blue (BPB) has been described by us (3). This reagent gives an intense blue color in the presence of trace amounts of carbonate ion. It was found that this reagent was much more effective than other chemical reagents on shoeprints when the $CaCO_3$- is the major component of the dust.

[1]Scientific officers, Toolmarks and Material Laboratory, Division of Identification and Forensic Science, Israel Police Headquarters, Jerusalem, Israel.

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In the following, we present a method which uses physical and chemical methods, sequentially, to enhance shoemarks left in dust. Shoeprints enhanced by this method were compared to those obtained by gel lifters. This method can be done sequentially with the other methods- the electrostatic and the gelatin lifters.

Materials and Method

A "white JAC vinyl" adhesive lifter having the dimensions of foot-print size 333 × 175 mm and manufactured by "Industrial Self Adhesives Ltd," Nottingham, England, has been used throughout this investigation. The adhesive lift is applied with a roller over the impression. It is then covered with a protective silicone sheet, prior to sending the sample to the laboratory. In the laboratory the lift is photographed before any chemical treatment. The adhesive sheet is then placed in a fume cupboard and sprayed lightly with 1% BPB in 5% of water in methanol until a thin layer of the yellow indicator covers the exhibit. If there is any need for further enhancement, the lift is then placed over a source of water vapor, such as an electric kettle, which activates the color reaction.

In order to compare gel and adhesive lifters, half of a shoeprint was lifted from a formica table using black gel, while the remaining complete shoeprint was lifted with adhesive sheet and then chemically treated.

Results

The comparative performance of gel lifter and adhesive lifter followed by BPB color reaction is described (Fig. 1). Two caseworks, that were received by the Toolmarks and Material Laboratory of the Israel National Police, are described (Figs. 2–3). In one such case, a faint shoeprint removed from a chair surface, had been determined as a "possible," when only model and size of the shoe were visible. No individual characteristics were observed in the original shoeprint. After treatment with BPB, however, a few major individual characteristics could be seen in the enhanced shoeprint. The conclusion that was reached was a "positive identification" when compared to the suspect's shoe (Fig. 2). In another case we were able to achieve a noticeable enhancement with many new details being revealed, but were unable to obtain a full identification (Fig. 3).

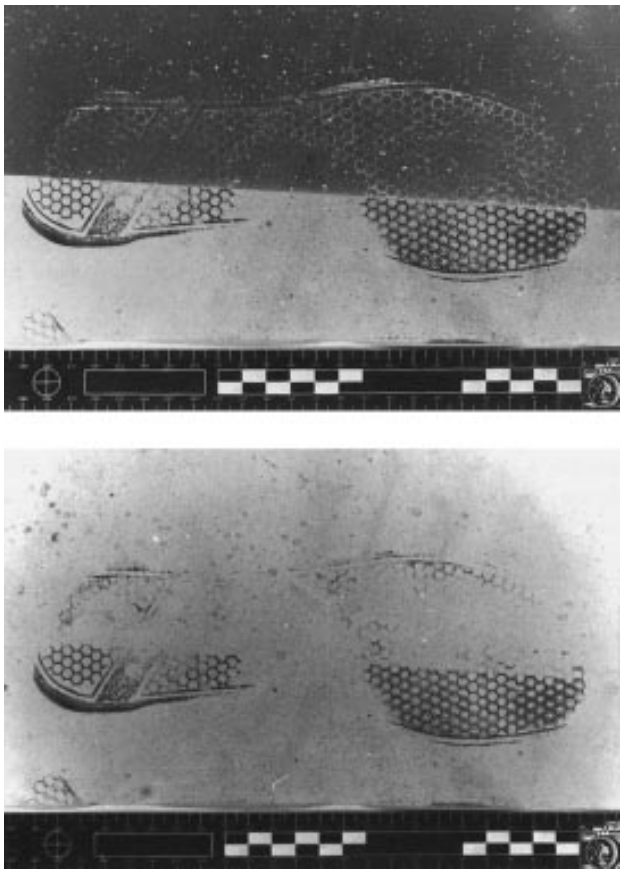

FIG. 1—*A. Upper side lifted by a gel, and lower side lifted by a white adhesive lifter and enhanced by Bromophenol blue. B. Complete shoeprint remaining after enhancement by Bromophenol blue.*

Discussion

A method where footwear imprints are removed from a crime scene for the purpose of enhancement and evaluation in the laboratory may appear to conflict with methods which attempt to develop marks in situ. Due to the vulnerable nature of shoeprints in dust, some crime scene technicians may indeed prefer to enhance these marks by direct application of BPB on items found at the crime scene. From our observations, however, it is imperative that these marks be retrieved using the simple method outlined above and any further testing carried out in the laboratory and we advise so for the following reasons. (1) Applying a white adhesive lifter provides a better contrast between the background and any developed impression. Photography becomes a much easier task since the chemical enhancement results in greater contrast between the unreactive background which remains white or yellow and the developed blue-colored dust particles; (2) Maximum contrast is achieved directly after applying water vapor, and in the comfort of the laboratory, there will be more time and resources to take forensic photographs; and (3) It is impossible to apply BPB directly on floor tiles. The background turns blue because tiles contain calcium carbonate.

Transparent footwear impression lifters are not desirable for lifting footwear impression and chemical enhancement. It is impossible to apply BPB enhancement on transparent or white gel lifters. The background turns blue which results in total loss of contrast. While adhesive lifters offer a great potential for removing and visualizing footwear imprints left in dust, this method is successful only on smooth non-porous surfaces such as formica, plastic, glass and porcelain floor tiles. We have had little or no success in lifting dusted impressions from paper, cardboard and cloth surfaces where the porous substrate itself or fibrous material from it becomes attached to the sticky adhesive, thus rendering it unmanageable for any further treatment. In such cases we recommend the normal protocol: electrostatic lift and gelatin lifter afterwards (1).

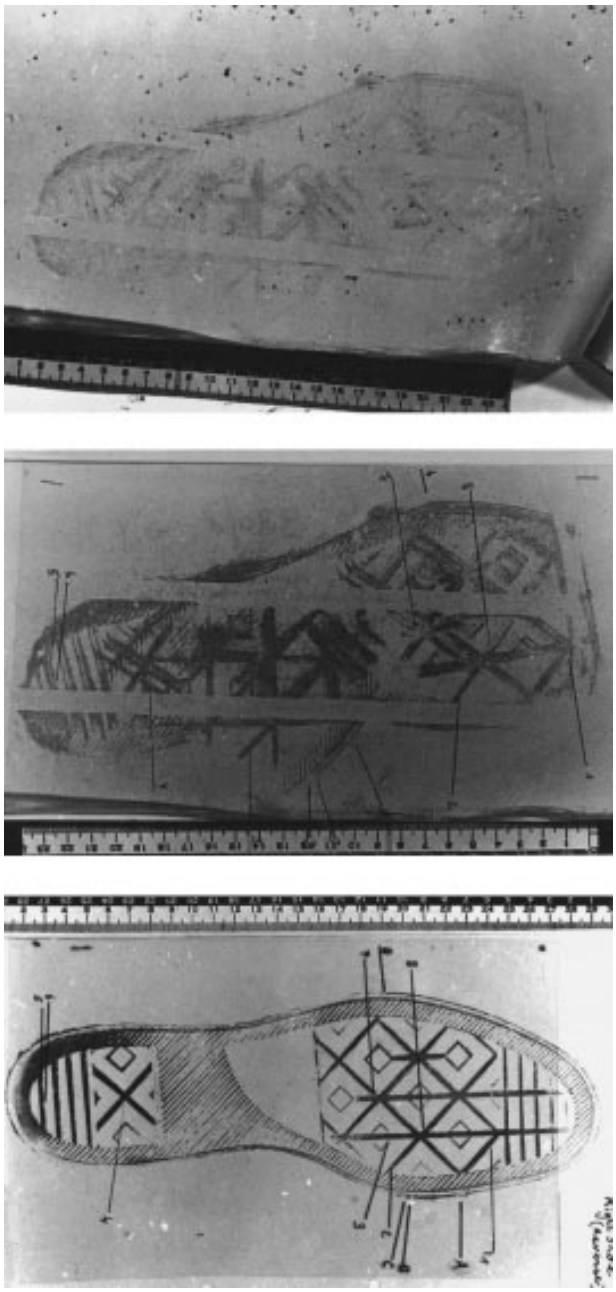

FIG. 2—*A. Shoeprint lifted from the scene of crime, before enhancement. B. Shoeprint after enhancement by Bromophenol blue. Individual characteristics are marked. C. Shoeprint of the suspect. Individual characteristics are marked.*

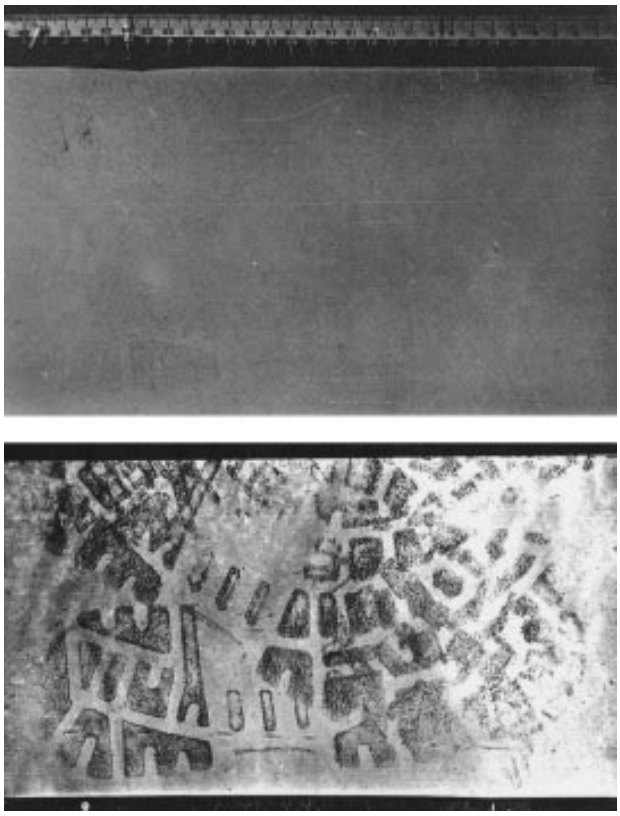

FIG. 3—*A. Shoeprint lifted from scene of crime before enhancement. B. Shoeprint after enhancement by Bromophenol blue.*

A method whereby adhesive lifters, applied on smooth surfaces, and chemically enhanced by BPB would, therefore, appear to be competitive with, and in many instances superior to gel lifter. Furthermore, from our experience and from others, adhesive lifters are not time dependent, whereas there exists a short time interval in which the gel lifters must be photographed before the print fades into the gel (4,5). This advantage is obvious when the item on which the impression has been made cannot be physically removed from the crime scene.

Conclusion

A simple method for lifting and enhancing shoeprint impressions in dust has been presented. By applying a white adhesive lifter combined with BPB enhancement we have obtained excellent results, that were found to be superior to the method of gel lifting. This new technique is operational in our laboratory, the Division of Identification and Forensic Science, Israel National Police.

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Additional information and reprint requests:
Yaron Shor, M.Sc.
Division of Identification and Forensic Science
Israel Police Headquarters
Jerusalem 91906, Israel