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Specialized Tools for Forensic Investigations: The Trace Mark™* Microstamp

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Abstract: The Trace Mark microstamp is a useful tool to mark valuable possessions for subsequent identification. The tool can be employed in several types of forensic applications, e.g. for identification of evidence, as a tamper evident trap, or to discourage substitution of components. A variety of tools have been fabricated by the manufacturer; however, the simplest of the microstamps can be the most versatile to the firearms and tool mark examiner, the evidence technician, or the investigating officer. Although the microstamp had its origins in the jewelry industry, the market is now directed towards the private citizen for marking personal possessions. As a law enforcement tool, the device is simple to use, reliable, and inexpensive.

Normally, the crime scene is examined for evidence of tool mark impressions from various weapons or objects used during the commission of a crime. [1] However, forensic tool marks are seldom considered for offensive application. Offensive use of tool marks can include subtle identification tagging or "dangling", that is, providing previously marked items to the criminal. When the opportunity does arise, the microstamp tool is effective for marking soft and hard metals (up to 45 Rockwell), as well as most thermosetting plastics. The microstamps

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* – Trace Mark is the registered trademark of the Microstamp Company, 2770 East Walnut Street, Pasadena, CA, 91107, (818) 793-9489.

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cannot be used for marking glass, glazed porcelain, or plastics that have a resilient nature. The surface tension of glasses and glazes chip easily, while the resilient materials do not retain the impressions.

The Trace Mark microstamp has features that give it both class and individual characteristics. The tool itself can be provided with both alpha/numeric characters, specific font styles, foreign languages, logos, or art work. The size of the die, and thus the impressions, can range from 0.25 mm (0.010") to 1.0 mm (0.040") depending upon the requirements. Therefore, the markings can be very discreet, or even disguised as a makers' mark, if necessary.

Procedures and Discussion

Application of the image is quite easy, although some practice is required. Two versions of the microstamp are available: a curved, roll-on type and a flat, head-on stamp. The roll-on tool is applied directly to the substrate, pressure is applied, and the device is carefully rolled in the x-axis while rocking it slightly in the y-axis. Firm pressure

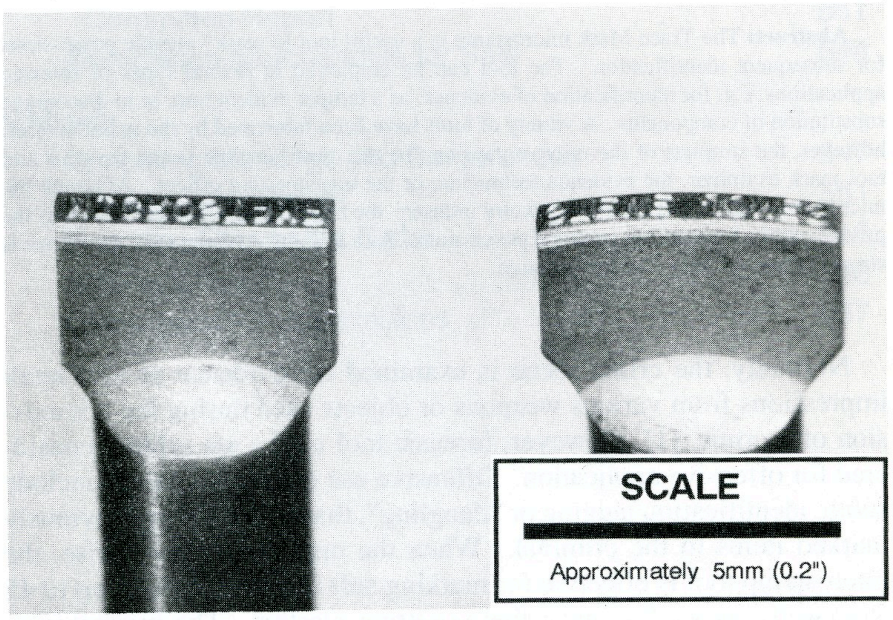

Figure 1

Left, head-on microstamp (note the flat face of die), and, right, roll-on microstamp (note the curved face of die)

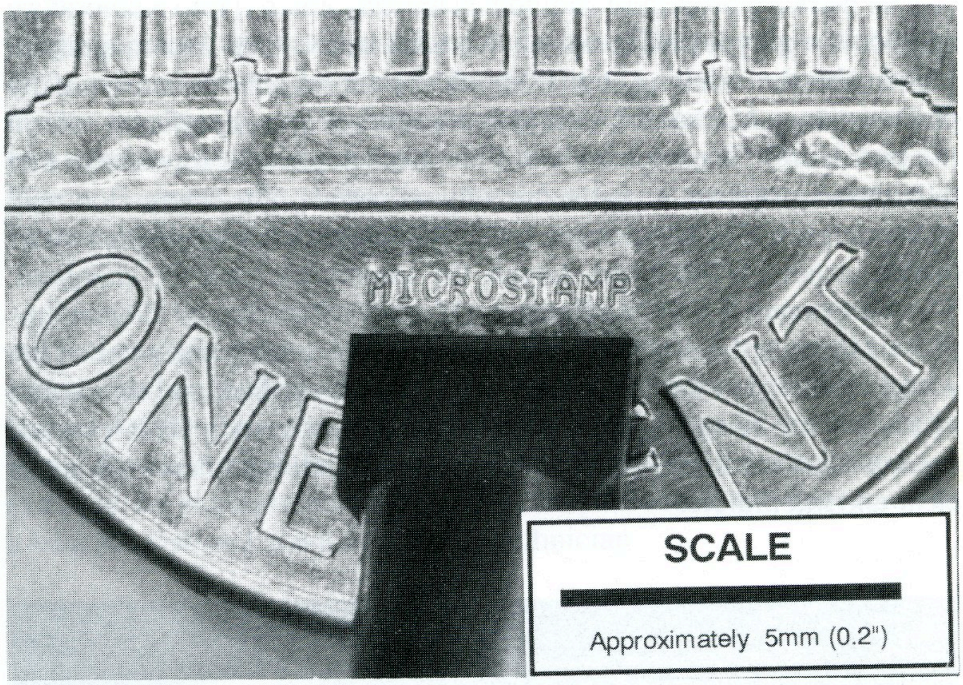

Figure 2

The 0.4 mm marking illustrates the clarity of the image at 12X. The substrate is a U.S. copper penny.

is required, but the net pressure is dependent upon the substrate. A tool designed for head-on stamping requires a tap with a light hammer. Figure 1 is a side-by-side comparison of the two microstamp tools.

A tool with a die cut of 0.4 mm (0.016") produces an impression approximately 0.025 mm (0.001") in depth. Figure 2 illustrates the clarity of the image on a United States copper penny.

The microstamp tool is precision made and cut from hardened steel. The life expectancy is quite long when used on relatively soft surfaces but can be drastically reduced if the tool is hammered against another hardened steel substrate. In laboratory tests, aluminum, brass cartridge cases, soft steel (including the barrel of a pistol) received the impressions well. The firing mechanism, which is made of hardened steel, was difficult to mark.

The marking procedure should be carefully entered into a laboratory notebook, e.g. type and location. An 8X loupe is sufficient magnification to see the marking, but it should be thoroughly documented by photography. Macro and microphotography play a significant role in the procedure. The object should be photographed in its entirety and then the microstamp image accurately recorded. The impression may be incomplete due to operator error; however, the photograph is adequate documentation even though the impression may be marginal. The Scopeman Video Microscope (Moritex, San Diego, CA) is employed in some laboratories to document the working site prior to the actual marking, immediately after the image is applied, and then again to review the image when the specimen is recovered. This practice ensures that the site is thoroughly mapped and the micromarking is clear and intelligible.

Figure 3

Technician operating the Scopeman Video Microscope, color monitor, and accessories. The photo is produced on a Mitsubishi still video printer, in color, and magnified as required. The photo will then be incorporated into the laboratory notebook.

Upon recovery of the evidence, the positioning and clarity of the image becomes an excellent tamper indicator. The presence or absence of the micromarking determines its authenticity; it also provides information concerning any manipulation of the specimen, e.g. substitution of a component during the period that it was out of official control. Figure 3 shows the technician documenting a specimen using the Scopeman Video Microscope.

Because the micromarking is so small, a device can usually be marked multiple times. In addition to the disguised image, the marking can be further hidden with paint or concealed under removable parts. Record-keeping is essential, because the marks can be lost on large items. It is best to place the marking adjacent to common locations, for example, on an electronic item near the on/off switch, and then again in a hidden location known only to the technician.

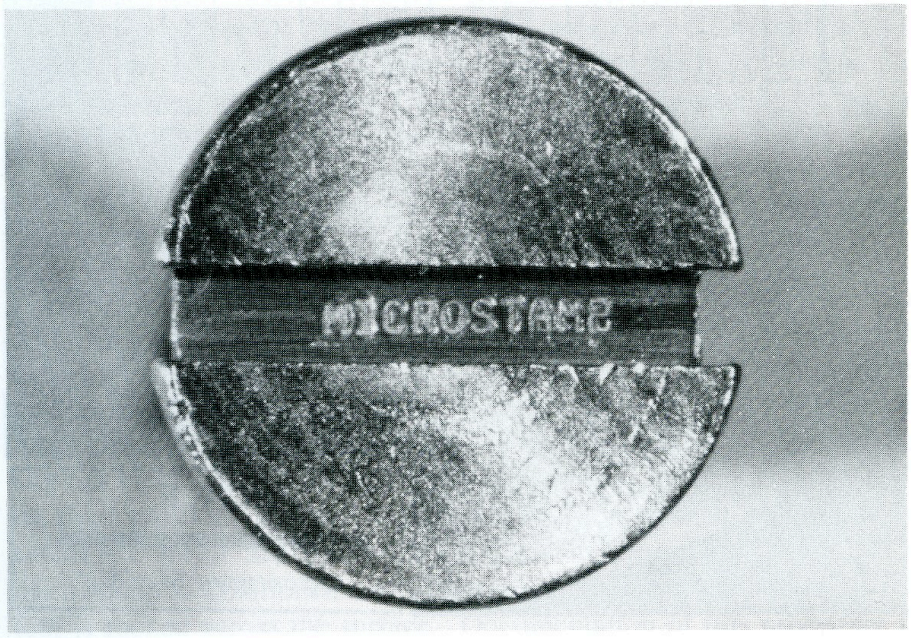

Figure 4

Micromarking concealed in the slot of a brass screw. Magnification is approximately 12X.

Corrosion and surface abrasion are factors which tend to destroy the image. The impression must be protected from environmental degradation. Surface oxidation (rust) and pitting are examples of impression degradation that are difficult to prevent. If the substrate is ferrous, it is likely that the image will eventually be destroyed due to corrosion. Protecting the micromarking is essential. Depending upon the scenario, the image may be protected by a thin layer of clear lacquer or by being positioned in a protected area.

A recessed area, such as the slot of a flat head screw, can offer concealment of the image as well as protection. Figure 4 reveals the presence of the micromarking in the slot of a brass screw. This unique position offers concealment and protection, and evidence of tamper if

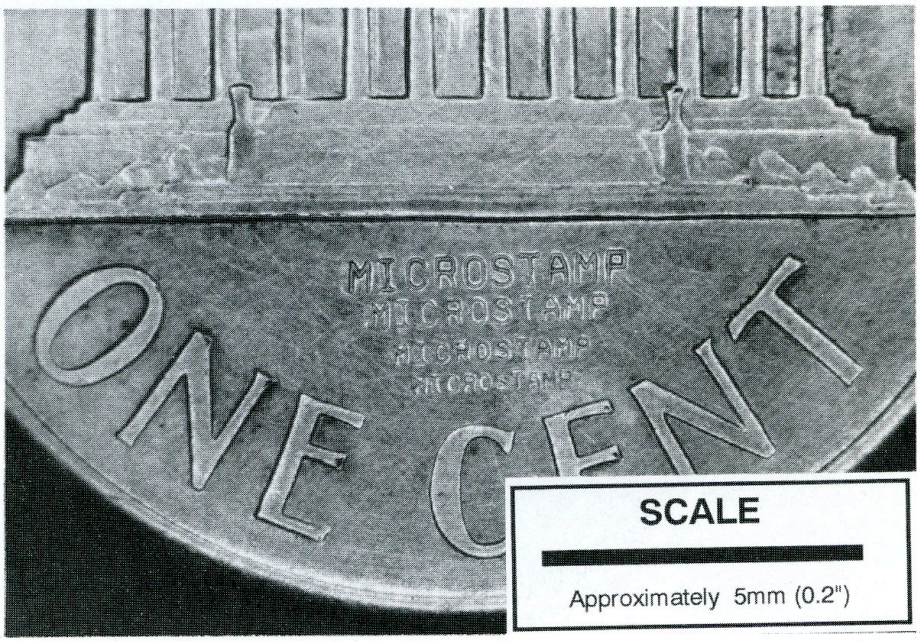

Figure 5

Four sizes of text stamped on the penny. Characters are, top to bottom, 0.5 mm, 0.4 mm, 0.3 mm, and 0.25 mm tall.

the screw is removed and reinstalled without extreme care. Other useful tamper indicators are solder terminals or a wax document seal.

Description of the Microstamp Tools

Both the roll-on and head-on microstamp tools are available with standard English alpha/numeric characters. Font sizes available range from 0.25 mm (0.010") to 1.0 mm (0.040") tall. Figure 5 is an exemplar of four sizes of text. Special characters and the non-English alphabet, e.g. Chinese or Arabic characters, are available on special order. Each die is precision cut from hardened steel (60 Rockwell) using a proprietary system developed for electrostatic discharge machining (EDM).

A variety of specialty tools are also available. The manufacturer can fabricate single character tools, as well as one which is designed for marking within the confines of a closed loop, such as a wedding ring. A recently designed tool employs an adjustable, automatic set punch for easy application of the die to the substrate. Corporate logos, makers' marks, miniature notary seals, and other art work can be engraved on dies of hand tools. Depending on the requirement, a tool can be fabricated to meet the need.

Experimental Procedure

As an example of how the microstamp can be used to mark a particular item for subsequent identification and possible detection of tampering, a hypothetical situation may be enacted. An appropriate position on an item, e.g. a screw, is selected to be marked. This could be on the head, in the slot, or along the shaft. In this experiment, the slot has been selected for marking. The screw is carefully installed in its final position, and the location on the screw head and a nearby reference point are documented. In this instance, the roll-on microstamp is positioned and moderate pressure is applied while the tool is rocked across the surface. Documentation of this procedure is repeated and the pertinent information entered in the lab notebook.

Conclusion

The Trace Mark microstamp tools offer unique capabilities to forensic scientists and the law enforcement community. Minimal training is

required; the equipment is inexpensive, simple to use, easy to maintain, and above all, unique. Evidence collection kits are not complete without these tools. With the combination of features the tool provides, virtually every law enforcement officer could possess a microstamp for officially marking evidence.

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Reference

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