Casting a Wide Net: Lifting Fingerprints from Difficult Surfaces, Mill Morris, August/September 2005

Casting materials are not just for bite and tool mark impressions, but can be used to obtain fingerprint evidence on rough surfaces, human skin, blood prints, and other types of evidence.

Ask any evidence technician or crime scene detective, “What is the best way to collect or preserve bite and tool mark evidence?” The answer would most likely be: use a casting material. Casting materials are great for recording gouges, scrapes, and scratches in metals and some types of wood products.

Traditionally, firearm and tool mark examiners use casting materials to record the scratches and striations on recovered projectiles, firing pin marks on bullet casings, and tool mark impressions from tools used to break in or pry open doors and windows. Tools often have nicks from wear and tear that leave individual characteristics. There are various types of materials used to record impression marks, such as: AccuTrans Auto-Mix, a casting silicone applied by an extruder gun; Mikrosil, a self-mix putty with a catalyst applied by spatula; Liquid Silicone, mixed with several different agents used to release the rubber or thin the rubber; and DuroCast, a compound mixed with a catalyst (hardener) applied by spatula.

New Technology for an Old Problem

As a Crime Scene Detective, I often look for new techniques that will aid me in the collection and preservation of crime scene evidence. When problems arise, old and new methods must be obtained or adapted to meet these problems. There are several common problems that crime scene evidence technicians and detectives encounter. One such problem is that of preserving fingerprint evidence on rough surfaces, human skin, blood prints, and curved surfaces.

Photography is the current choice to record fingerprints on rough surfaces, human skin, blood prints, and curved surfaces; however, poor lighting conditions, type of surface, and a technician’s knowledge of photography all play a crucial role in the quality and usefulness of the photos. Photographs should always be taken but other methods should also be used to preserve fingerprint evidence, especially when photographical means fail to record the image properly. This is the reason why I began to experiment with using casting materials for applications other than what they were intended.

Casting materials usually come in white or brown. Different colors give the evidence technicians a better choice of selecting a contrasting color when used with fingerprint powders. When casting materials are used to lift fingerprints, the technician lifts a reverse image of the print. This image must be reversed for comparison. Reversing the image is accomplished by photography. The image is photographed and the negative is simply reversed for printing. Technicians with

access to an AFIS (Automated Fingerprint Identification System) simply scan the lift into the AFIS. The image can then be directly checked in the database.

Rough surface prints do not lift with ordinary hinge lifters. The textured surfaces tend to break up ridge formations. Casting materials fill in the textured areas allowing the whole print to be lifted. I set out to determine if casting materials could be used for lifting prints from surfaces that are traditionally difficult.

Current casting studies talk about lifting prints from uneven surfaces and tool marks. Few studies have been done involving the use of casting materials to recover latent fingerprints on other types of surfaces or evidence.

Choice of Casting Silicone

For my experiments, I chose to use AccuTrans® Auto Mix from Ultronics, Inc., a casting silicone applied by extruder gun. The material, also used in the dental industry for making impression molds, is flexible and does not distort the image. Once the impression is lifted, it cannot be smeared or smudged; it is permanent on the lift. The extruder gun allows the material, and not the tip of the gun, to come in contact with the fingerprint, preserving the integrity of the print.

The silicone comes in both white and brown and is also available as a transparent material. This allows for instant comparison of the print without reversing the image. The transparent silicone allows the technician to place the lift on any color of background. This works well for photographic purposes. The silicone can be used on curved surfaces, horizontal, and vertical planes. When used on vertical planes, only a small amount of the silicone is needed. The material will smooth itself over the area. If too much of the material is applied, the silicone may run down past the fingerprint. To avoid this, the technician can simply place a piece of tape a few inches below the print. The tape will allow for the excess to gather in this area. This casting silicone can be used on rough surfaces, human skin, blood evidence, and curved surfaces.

It should be noted that before treatment with silicone, rough or grooved surfaces should first be dusted with magnetic fingerprint powders. Magnetic powders come in a variety of colors, which is beneficial for surface contrast and for photographic purposes. Magnetic powders contain ferromagnetic particles. The powder is applied using a magnetic applicator or wand. The powder sticks to the wand. The advantage here is that the applicator does not come into direct contact with the print, just the powder. Excess powder is easily removed by moving the applicator back over the print. Magnetic powders cannot be used on other ferrous surfaces.

Experiment 1: Rough Surfaces

My first experiment was to place test prints on rough surfaces. Prints were placed on bricks and textured surfaces including the side of a computer monitor, textured wall, and leather handbag. The prints were then dusted with black magnetic powder. The prints could be viewed by the naked eye and could have been photographed. Both white and transparent casting silicones were then placed on top of the dusted prints. Once the silicone had hardened, the casts were removed from the four surfaces. The silicone lifts contained very good ridge

detail; they were of comparison quality. One must remember that the prints lifted by the white silicone contain a reversed image and the transparent lift would not be a reversed image because the image can be viewed as it was on the surface. The transparent lift allowed me to do a direct comparison for minutia points. Figures 1-7 show my results.

Figure 1 Print on Brick

Figure 2 Transparent silicone lift from brick

Figure 3 White silicone lift from brick

Figure 4 Fingerprints on side of textured surface (computer)

Figure 5 White silicone lift from textured surface (computer)

Figure 6 Transparent silicone lift from textured surface (computer)

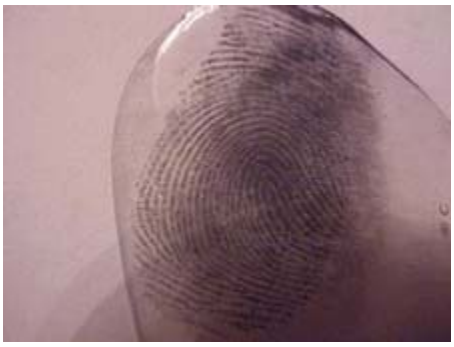

Figure 7 Transparent silicone lift from textured wall

Experiment 2: Human Skin

Lifting fingerprints from human skin is one of the hardest tasks a crime scene technician can attempt. There are many factors that contribute to the rapid deterioration of the fingerprints on human skin. Heat, moisture, age of the fingerprint, condition of the skin, and environmental exposure all affect recovery. Most prints on human skin must be recovered within the first few hours of deposit. There are many chemical applications used to enhance fingerprints on human skin. Cyanoacrylate (superglue), fuming (then treated with a luminescent stain), iodine fuming, and ninhydrin are just a few of the chemicals used for enhancing fingerprints on dead bodies. The most common techniques for preserving prints off of “live” skin are the use of magnetic powders, lifting paper, and photography.

For my second experiment, I placed several test prints on my skin. I pressed several of my fingers into my forearm for about 20 to 30 seconds. Afterward, I dusted the area with black magnetic powder. The prints could be seen by the naked eye and were of photographic quality. I tried to lift the prints with conventional hinge lifters, but this did not produce a quality lift. I then covered the test prints with white and transparent AccuTrans casting silicone. After the silicone had hardened, the lifts were removed.

The ridge details on the transparent lifts were of comparison quality. The transparent silicone had better ridge detail than the white. The white casting silicone lifted the print too, but skin patterns could be seen on the print. The skin pattern interfered with the minutia points of comparison. This problem can be corrected by using a scanner program that allows the technician to remove the skin pattern by filtering them out. Once the area is filtered, the print can be seen.

The transparent casting silicone eliminates this process altogether. No skin patterns were seen in the transparent casting silicone. The transparent material allows for direct comparison of minutia points. This technique, which worked well for fresh prints, under two hours old, can be used on live and dead bodies. The main advantage of the casting silicone over lifting papers is that there is no fear of smearing the print. The silicone lift also preserves the print for additional examination at a later date.

Note that magnetic powder is not carcinogenic thus is safe to use on live persons. After dusting and lifting a print, the area dusted with magnetic powder

should be washed with soap and water. Those persons who have skin rashes or skin allergies should not be dusted with the magnetic powder. Dusting them may cause additional irritations and redness.1 The AccuTrans is also non-toxic. The material is made from Polyvinylsiloxane, a silicone elastomer. It has no harmful reactions or secondary effects.2 It is advised to wash with water after handling the silicone and avoid contact with eyes.3 This type of material was originally developed for use in dental procedures. Figures 8 and 9 show results of my experiments using human skin.

Figure 8 Fingerprint on human skin

Figure 9 Transparent silicone lift from human skin

Experiment 3: Blood Prints

Bloody fingerprints are often found on crime scenes. Bloody fingerprints are traditionally treated with chemical properties to enhance them for photographic purposes. They cannot be lifted after treatment. The chemicals used are attracted to the proteins in blood or heme (hemoglobin molecules) of red blood cells. Benzidine was previously one of the most popular chemicals used to enhance prints; however, it was found to be extremely carcinogenic and is no longer used for the enhancement of bloody fingerprints. Other chemical applications used to enhance bloody fingerprints include Amino Black, which is sensitive to the proteins in blood.

Fresh blood prints that are easily seen are photographed for evidential value and comparison purposes. Again, the technician must rely on his or her photographic abilities and hope nothing goes wrong during the photo taking or the processing of the film. Technicians find blood prints on a variety of surfaces and items which often cannot be taken back to the laboratory for further analysis. Being able to lift a blood print would allow the technician to preserve the print for court purposes or take any additional photography after the technician has left the crime scene.

For my third experiment, I placed several bloody test prints on tile, painted walls, a plastic dispenser, and raw drywall. After the prints dried, they were dusted with black magnetic powder. The white and transparent casting silicone was then placed on top of the dusted blood prints. After the silicone had hardened, the lifts were removed. Both the white and transparent silicones were able to lift the

prints from the tile, plastic dispenser, and painted wall. The raw drywall blood print could not be lifted. I speculate that this is due to the absorption of the blood into the raw drywall. The prints that were lifted were of comparison quality. It is also important to note that after the first lift was removed, a second dusting of magnetic powder was applied and then the silicone again. The second lift was of better quality than the first. This technique would allow the technician to preserve the print after photography. See Figures 10-12 for photos of my results.

Figure 10 Blood print **Figure 11 White silicone blood print**

Figure 12 Transparent silicone blood print lifted from plastic dispenser

Experiment 4: Curved Surfaces

Fingerprints are often found on curved surfaces such as doorknobs, bottlenecks, cans, and glasses. Fingerprints developed on curved surfaces are usually lifted by gel-lifters or roll tape. Care must be taken to ensure that no air bubbles are trapped, which could lead to the distortion of the fingerprint. Most often, gel-lifters or tape must be cut to fit the curved surface. When ordinary hinge lifters are used on curved surfaces or tape that has not been cut properly to fit the area, creases often form because the tape or lifter tries to wrap around the curve surface. These creases interfere with the fingerprint. My experiments showed that casting silicone can be used to lift prints on curved surfaces.

Several test prints were placed on various curved surfaces for my fourth experiment. I placed prints on doorknobs, bottlenecks, and a gun magazine. The test prints were dusted with black magnetic fingerprint powder. The white and transparent casting silicone was then placed on the test prints. The white silicone lifted the prints on the gun magazine. The material molded itself around the magazine. The lifts were of comparison quality and the ridge detail was excellent. The transparent silicone was used on a beer bottleneck. The transparent silicone smoothed itself around the print. The detail and quality of the lift was excellent. The transparent silicone would lay flat after it was removed from the bottleneck.

The white silicone from the gun magazine did not lie flat by itself. The white and transparent silicones are excellent sources for lifting fingerprints from curved surfaces. Figures 13-17 show my results.

Figure 13 White silicone cast

Figure 14 Inside view of white silicone cast

Figure 15 Close-up of fingerprints lifted from curved gun magazine

Figure 16 Transparent silicone lift placed on an orange background for color contrast

Figure 17 Transparent silicone lift from the neck of a beer bottle

Conclusion

In conclusion, all fingerprints must be photographed before any type of recovery is attempted. Photography, however, should not be the only means used to preserve fingerprints. Hard to lift prints, such as those on rough surfaces, human skin, blood, and curved surfaces can be accomplished by using magnetic powder and casting silicone. Silicone lifts provide a means to preserve fingerprints from some of the most difficult surfaces. Additionally, transparent silicone will allow the technician to lift the prints and perform a direct fingerprint comparison without having to reverse the image. The silicone lifts are permanent and will not smear or become smudged when touched. The use of silicone casting is faster and safer than most chemical applications. My experiments prove that casting silicone is not just for tool and impression marks, but fingerprints too!

References

1. Lightning Powder Company, Inc., January 20, 2003, Material Data Safety Sheet
2. Coltene Whaledent, January 2004, Product Instruction for Use Sheet
3. Coltene Whaledent, December 2004, Safety Data Sheet

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