

TECHNICAL NOTE

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A New Silicone Rubber Casting Material Designed for Forensic Science Application

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ABSTRACT: The need for an improved silicone rubber casting material has been evident for years. Products currently available must usually be coated or colored to make them opaque so that fine detail can be microscopically observed. A new product manufactured in Sweden has properties that make it superior to other casting materials currently available. Visibility of detail in casts made from shallow marks is dramatically increased because of its reflective properties and uniform opacity. Besides the usual tool mark applications, the material has been found useful in the comparison of firing pin impressions where lighting is a problem. It is beneficial in the examination of shiny surfaces such as extractor marks on cartridge casings and on plastic surfaces.

KEYWORDS: forensic science, silicone rubber, castings, tool marks

Forensic scientists have relied upon dental silicone rubber casting materials for the recovery and identification of tool marks for a number of years. Rather than collect a large piece of evidence it has been found quicker and more convenient to cast the evidence tool marks.

The author has tested and used a number of silicone rubber casting materials. The microscopic detail on casts made with these products are difficult to observe because they are slightly translucent. This has been the major drawback of these products.

Several techniques have been employed to improve dental casting materials. Smoking the surface of the cast by burning magnesium ribbon was successful in making the surface opaque. The main problem with this technique was that the fine striated detail was obscured. It was difficult to control the thickness of the layer of magnesium deposited which resulted in some fine striae being covered. Other techniques to highlight the details included dusting with fingerprint powders including silver and gold colored powders.

In 1979, Goldman [1] suggested coloring the casting material itself with fingerprint powder as an alternative to smoking the cast or dusting the surface of the cast. Coloring the casting material with black fingerprint powder was a substantial improvement over other options available at that time.

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A new casting material designed especially for forensic science use was developed in Sweden. That product is called Mikrosil[®] and is now distributed in the United States. It has been formulated to give good rendering of small details, and a short setting time. Mikrosil has a uniform consistency and does not have observable pigment particles.

Comparative Tests

The material has been tested by the Stockholm Police and the Swedish National Laboratory of Forensic Science in Linköping. The results of their tests are very promising. Results of tests conducted at my office indicate that the visibility of detail in casts is dramatically increased because of its uniform opacity and reflective properties. In fact, in many cases, examination of the Mikrosil cast was superior to examining the actual evidence item directly. For example, marks on shiny cartridge cases and bullets could often be better seen by comparing Mikrosil casts than by direct microscopic comparison of the evidence item. There have been several cases where identifications were made using Mikrosil that would not have been possible by direct comparison or by using dental silicone rubber. Tests indicate that the

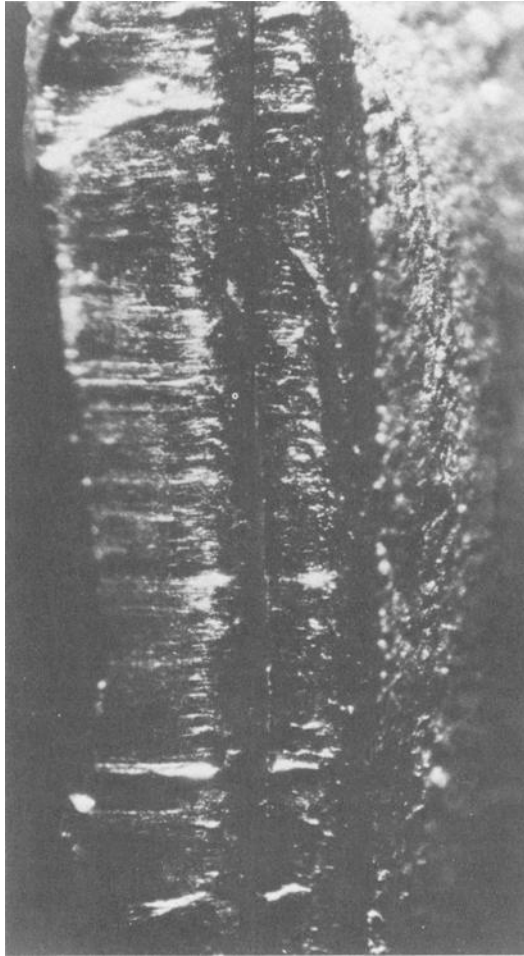


FIG. 1—*Direct comparison of the marks on two cartridge cases.*

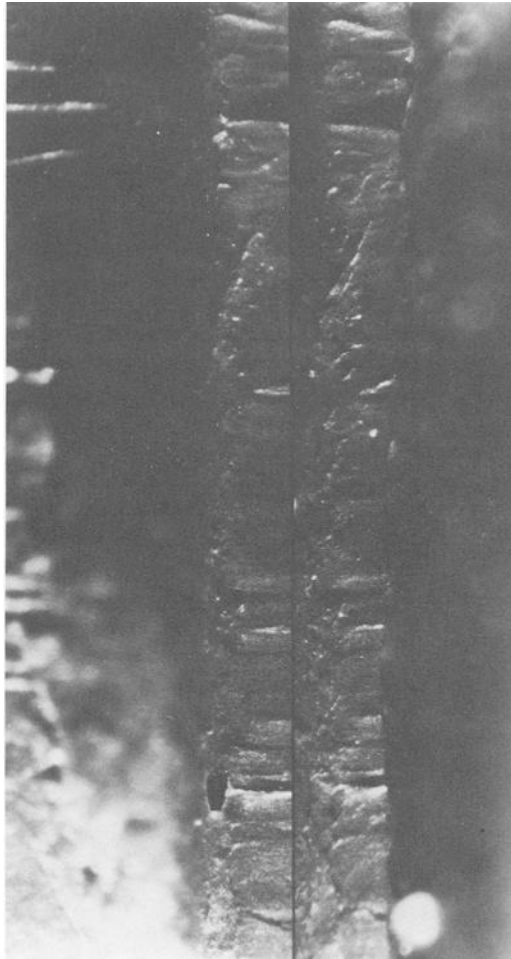


FIG. 2—Comparison of Mikrosil casts of the marks from two cartridge cases.

dental product had recorded the fine detail; however, it was translucent and therefore could not be observed or photographed.

A test was conducted to determine if shrinkage was a problem with Mikrosil. A machinist's rule was cast with Mikrosil and with a dental silicone rubber casting material that our laboratory had used up to that time. One Mikrosil cast was kept in the windshield of our crime scene vehicle for a period of six months. The other cast was stored under laboratory conditions. Microscopic comparison of the machinist's rule marks on both casts indicated that no shrinkage had occurred on the cast that had been in the scene vehicle.

Marks on two cartridge cases (evidence and test, respectively) are shown in Fig. 1. The same areas were cast with Mikrosil and the casts were photographed using the comparison microscope at $\times 45$ magnification. They appear in Fig. 2.

Figure 3 shows a firing pin impression in a cartridge case from a crime scene and a firing pin impression in a reference cartridge case. In Fig. 4 the same marks were cast with Mikrosil and then photographed with the comparison microscope. Where the weapon cannot be test-fired a direct cast of the breech face can be used.

Mikrosil is brown in color and is supplied in a squeeze-type tube. The paste catalyst is

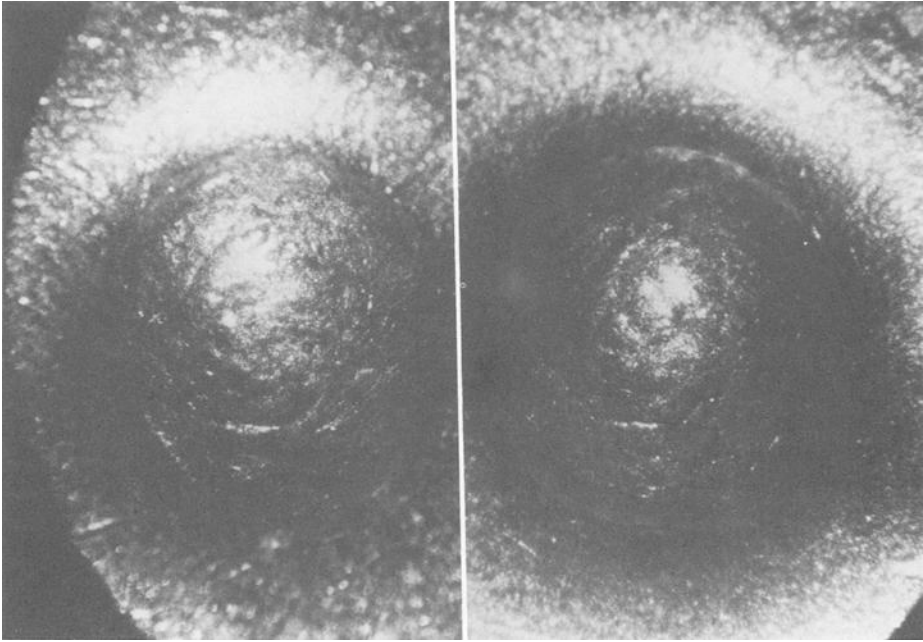


FIG. 3—*Direct comparison of the firing pin impression on two cartridge cases.*

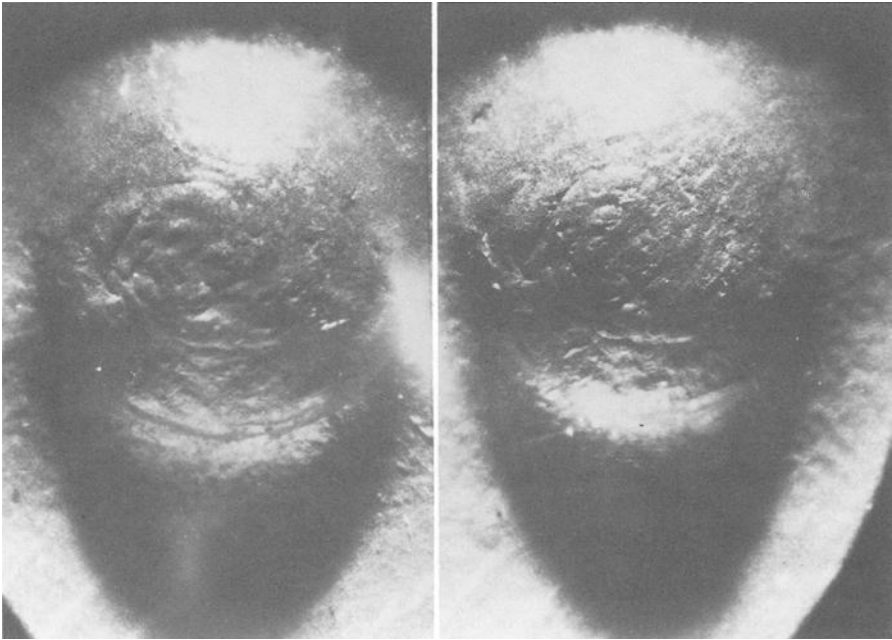


FIG. 4—*Comparison of Mikrosil casts of firing pin impressions on two cartridge cases.*

supplied in a smaller squeeze tube. Equal lengths of Mikrosil and catalyst are placed on a mixing pad and are thoroughly mixed with a spatula. Two paste catalysts are supplied. The slow catalyst is for room temperature use and the fast is for cool temperature use. Setting time can be shortened or lengthened by increasing or decreasing the amount of catalyst used. Paint thinner has been found to be a good solvent for removing unwanted Mikrosil from tools and so forth before it has set.

Summary

Mikrosil can usually be used to advantage when marks are on a shiny metallic surface or when they are on a plastic translucent surface. The material is suitable for all types of tool marks and has other more specialized applications. It has been found that more microscopic detail can often be seen in Mikrosil casts of marks than by direct comparison of the marks. Identifications have been made utilizing Mikrosil that would not have been possible by direct comparison or by using dental silicone rubber.

Acknowledgment

The photographs were provided by Kjell Carlsson of the Stockholm Police Department Crime Laboratory, Stockholm, Sweden.

Reference

- [1] Goldman, G. L., "Coloring Casting Materials as an Alternative to Smoking or Dusting Casts," presented at the Semi-Annual Seminar of the California Association of Criminalists, held in Oakland, CA, Oct. 1979.

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