An Evaluation of Ferromagnetic and Non-Ferromagnetic Fingerprint Powder on Ceramic Materials[1]

James A. Bailey, Cape Fear Community College, Wilmington, NC

After attending this presentation, the participant will understand: (1) the use of ferromagnetic fingerprint powder compared to non-ferromagnetic fingerprint powder used to process the surface of glazed ceramics, (2) variables that affect the condition of latent fingerprints, (3) a method of assessing and evaluating the quality of latent prints based on their appearance.

The purpose of this presentation is to present the results of a study that evaluates the quality of latent prints collected from the surface of glazed ceramics using ferromagnetic and non-magnetic fingerprint powders. In general, ceramic type material is typical when processing crime scenes, especially in residential burglary cases. The use of the powder method for processing surfaces or items is routine in investigations where objects may have been touched recently by perpetrators. However, some fingerprint powders have different adhesive qualities based on the characteristics of the powder as well as the surface or matrix of the object being processed.

The investigator's awareness of the magnetic interference using ferromagnetic powder on the surface of ceramics will provide the investigator with a better understanding and utilization of this type of powder.

The familiarity with processing recently touched glazed ceramics with ferromagnetic powders compared to non-ferromagnetic powder will provide the investigator with information on latent print quality and the interference of ferromagnetic powder with the matrix of ceramic material. Ferromagnetic powders adhere more readily to the surface of ceramic material than non-ferromagnetic powders because the matrix of ceramic material contains minerals that have some magnetic properties.

The term ceramics refers to non-metallic inorganic material including pottery, porcelain, tiles, and bricks. The base material used in ceramics is clay and the clay contains minerals that are magnetic. When a ferromagnetic fingerprint powder is used to dust the surface of a ceramic material there is interference from the two magnetic materials that come into contact with each other. This interference affects the quality of the resulting latent prints because there is more powder adhering to the background or area around the latent print.

In addition to the two types of fingerprint powders used in this study, there are other variables that affect the quality of latent prints obtained from evidentiary objects at the crime scenes. Some of those variables include: the age of the print, the chemical composition of the perspiration, climatologic environment, the porosity of the surface, the material type and its matrix, as well as the type of latent print method such as powders or chemicals that are used to process the objects. The estimated age of the latent print is an important factor used in selecting the processing method. The age of the latent print may not be known by the investigator but can sometimes be estimated based on information from witnesses or persons who had knowledge of the conditions at the scene before it was altered.

For this fingerprint study, twenty cups were collected from flea markets and yard sales. The sampling includes cups of various qualities. Some are marked as fine china

and others as stoneware or ordinary cups. The outside surface of each cup was selected for testing. The range of thickness for the cups' sides is from .090 to .270 thousands of an inch. The average thickness is .204 thousands of an inch. The cups are mostly white to cream in color with the presence of company logos and other designs present with different colors. The area selected for testing is absent of any logo or designs. The impression on the bottom of the cups revealed that one-cup was from Bavaria, five from China, two from England, four from Japan, one from Korea, one from Taiwan, two from Thailand, and four from the United States.

The cups were washed and wiped cleaned before testing. An area was circled in pencil on the outside of the cup and a latent print placed inside the marked area. An impression with the same approximate pressure was used to leave each of the latent impressions. The hands of an adult female were dipped in a water solution to obtain the same amount of residue on each finger. The hands were allowed to dry for 5 minutes and the cups were kept in a room at 70 degrees Fahrenheit for two hours before dusting for latent prints. Black ferromagnetic and non-ferromagnetic powders were used to process each of the ceramic cups.

A Likert type scale was developed and used to evaluate the quality of each latent print in the study. Latent prints were given a number between 1-5 depending on the evaluator's assessment of each print. The latent print scale included: 1) acceptable ridge detail with some powder adhering to the background surface, 2) some ridge detail present with light amount of powder adhering to the background surface, 3) some ridge detail present with moderate amount of powder adhering to the background surface, 4) no ridge detail present with light amount of powder adhering to the background surface, and 5) no ridge detail present with moderate amount of powder adhering to the background surface.

The quality of each print was evaluated after the impression was lifted from the ceramic material and placed on a latent lift card using clear two-inch latent lift tape. The evaluation of the impression was performed using four-power magnification.

The results of the study indicated that ferromagnetic powder produced better quality latent prints even though there was more background powder adhering to the glazed surface of the ceramics than the non-ferromagnetic powder. The ferromagnetic powder produced some ridge detail on 35 % of the cups processed and 15% of the impressions had acceptable ridge detail for comparison purposes. The non-ferromagnetic powder produced some ridge detail on 30 % of the cups, but none with acceptable ridge detail for comparison purposes. Using non-ferromagnetic powder, 70 % of the cups processed had no ridge detail and but had some adhesion of the powder to the background. Using ferromagnetic powder, 65 % of the cups processed had no ridge detail but had a moderate amount of powder adhering to the background. There was no observable difference for either type of powder based on the thickness of the cups; however, there were some detectable differences in the degree of magnetic attraction between the magnetic powder applicator and some of ceramic cups.

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