

# **Enhancing Bloody Footwear Impressions: Infrared Photography Compared to Amido Black Treatment<sup>1</sup>**

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Footwear impression evidence is difficult to observe on dark or multi-colored fabric; therefore, impression evidence could easily be overlooked at crime scenes. Investigators should search for garments or fabric items that could contain bloody impression evidence although blood evidence may not be readily detected on the fabric items. Some chemical tests used for bloody footwear impression enhancement include: luminol, Hungarian red, Crowles double staining solution, aqueous leucocrystal violet (ALCV) and amido black. Some of these chemicals yield improved enhancement on porous surfaces and some yield improved enhancement on nonporous surfaces. The purpose of this presentation is to present the results of a study that evaluates infrared photography and amido black for enhancing bloody shoe impressions on dark or multi-colored fabric. Footwear impression evidence is probable at scenes where blood evidence is present.

In this experiment, 20 footwear impressions were prepared for infrared photography and subsequently treated with a solution of amido black (Naphthalene Black 12B), a protein dye stain that turns blue-black when it comes into contact with blood. A variety of fabrics including solid dark colors, multi-colored designs, floral prints, and plaids were selected for testing. The fabric samples also contained different weave types and fiber blends. The fabric samples were cut into pieces 15.24 cm by x 35.56 cm (6 in x 14 in) in size. Ten samples were 100% cotton, five samples were 100% polyester and five samples were mixed blends. The mixed blends included one sample of 90% polyester and 10% cotton, one sample of 50% polyester and 50% rayon, one sample of 72% polyester and 28% cotton and two samples that consisted of 60% cotton and 40% polyester.

Bloody shoe impressions on the fabric samples were collected by using the following procedure. A piece of 100% white cotton fabric was placed in a glass dish 22.86 cm x 33.02 cm (9 in x 13 in) and saturated with bovine blood. Each shoe impression was produced by stepping onto a piece of presoaked bloody cotton fabric in the glass dish and then by stepping onto a pre-cut fabric sample. The sample impressions were allowed to dry. Once dry, both color and infrared photographs were taken to enhance the impressions. The samples were then treated with a solution of amido black. The amido black solution was prepared by adding 0.2 grams of amido black to 90 mL of methanol and 10 mL of glacial acetic acid. Each sample was saturated with the amido black solution using a wash bottle while holding the sample in a glass dish at a 45 degree angle. After 2 minutes, the samples were washed with a mixture of 90 mL methanol and 10 mL glacial acetic acid to reduce background staining and dried at 20°C (68°F).

Digital infrared images were made with a 35 mm Nikon D-70 camera with an 18-70 mm f 3.5 – 4.5 G ED-IF AF – S DX Nikkor lens and a 67 mm #87 infrared Tiffen filter. The jpeg fine setting with a medium image size was used to record the exposures. The image file size for this combination of settings was approximately 1.6 mega bytes per image. Experimental camera settings were used to determine the most effective

exposure. The lens to object distance was 22.86 cm (9 in). The shutter speed was approximately 2 seconds at f - 3.5 using daylight illumination. The results provide the investigator with a procedure to record optimum digital infrared images of bloody footwear impressions.

Of the 20 footwear impressions, 9 (45%) were enhanced using infrared photography and 11 (55%) were not. Of the samples enhanced, 4 (20%) were 100% cotton, 4 (20%) were 100% polyester and 1 (5%) was from the mixed fabric blends. The mixed blend fabric that was enhanced was 60% cotton 40% polyester.

Of the 20 footwear impressions, 11 (55%) were enhanced using amido black and 9 (45%) were not. Of the samples enhanced, 6 (30%) were 100% cotton, 1 (5%) was 100% polyester and 4 (20%) were mixed fabric blends. All of the footwear impressions on the mixed blends were enhanced by the amido black.

Infrared could be utilized to record images of footwear impressions on dark colored fabric because the procedure is nondestructive and the results are immediate. However, if the infrared image is unsatisfactory, amido black enhancement could be attempted as an alternative method on the evidence. Even though there is some background staining with the use of amido black it does enhance pattern details on some fabrics. Also, according to one study there have been successful attempts in DNA typing after using amido black for the enhancement of bloody impression evidence.

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